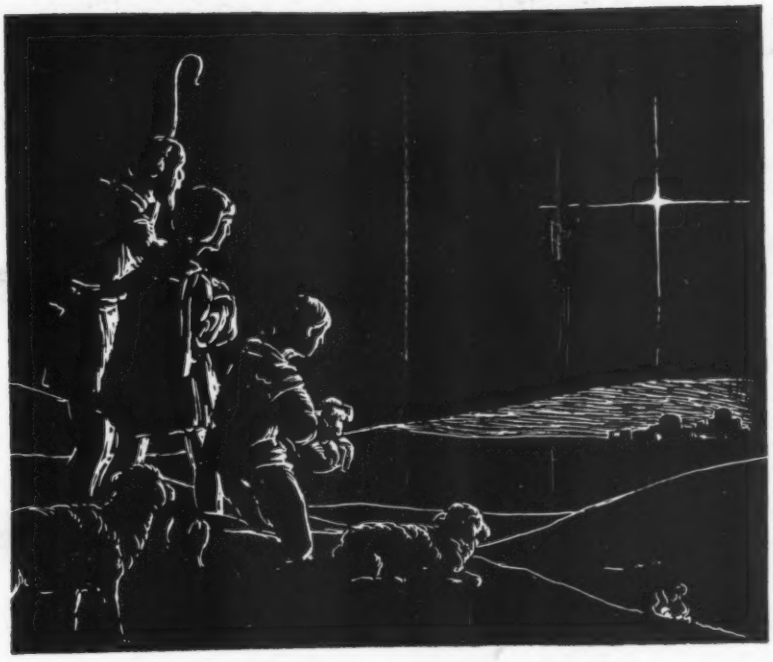
JANUARY, 1941 VOL. 30, NO. 1

DEC 19 1940

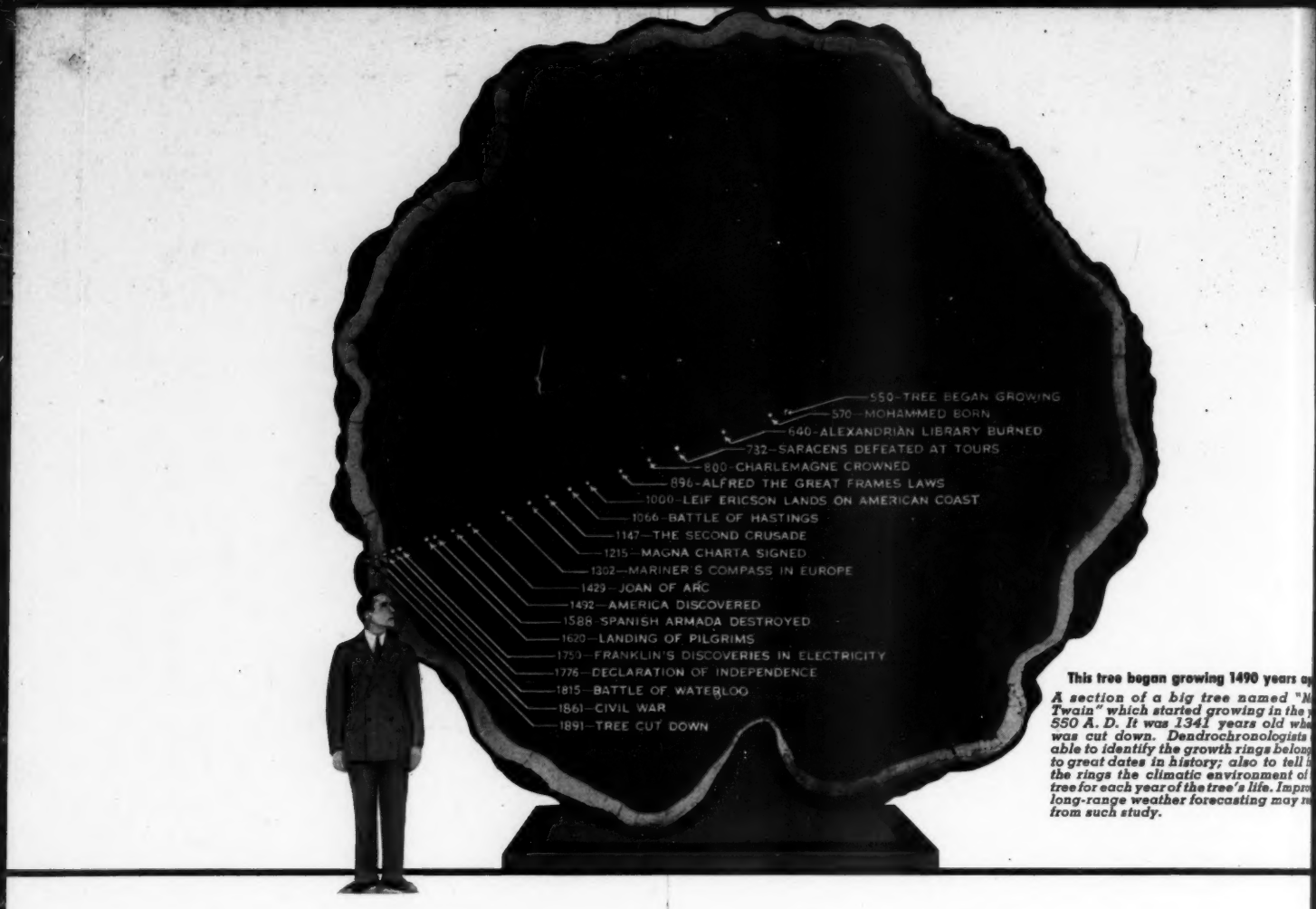
INDUSTRIAL ARTS and VOCATIONAL EDUCATION

PERIODICAL ROOM
GENERAL LIBRARY
UNIV. OF MICH.



In This Issue: Training W[illegible] or Industrial Citizenship

By Boyd C. [illegible] Willis E. Giese



This tree began growing 1490 years ag

A section of a big tree named "M Twain" which started growing in the y 550 A. D. It was 1341 years old wh was cut down. Dendrochronologists able to identify the growth rings belon to great dates in history; also to tell the rings the climatic environment of tree for each year of the tree's life. Impro long-range weather forecasting may re from such study.

It's Dendrochronology

BUT YOU CAN'T SAW A MAN APART AND GET THE SAME RESULT

Dendrochronology is a big word with a simple meaning. It means "life history of a tree" and it is the name of the science that enables mankind to piece together an amazingly accurate history of climate and events for centuries before white men ever saw America. A dendrochronologist reads the story of droughts and floods and forest fires in the annular rings of a tree as easily as you read this morning's newspaper.

Of course, it is not possible to saw a man in half to study his "growth rings" but it *is* absolutely true that men, like trees, carry throughout their entire lives the undying imprint of even their earliest environmental influences. In fact, the impressions made on the minds of men *before* the age of 20 are so much deeper, so much longer lasting, of such greater consequence in molding character, that this is the time in which apparently trivial considerations of the moment can really be turning points on the road to success.

Real educators never overlook this opportunity . . . and responsibility. They go beyond the mere routine of "instruction" and surround their students with proper influences of environment which can not only fan into flame the spark of achievement born into the heart of every mother's son but which will foster that discrimination which is so necessary for a successful career.

Instructors in mechanical drawing have an excellent means of meeting this vital responsibility.

In the work that they teach, in the instruments that they use, the lesson is plainly seen. Especially do they urge the use of fine quality drafting instruments. Chosen with care, these instruments in the act of truly creative work can open up a new realm in the imagination of a youngster. They set a goal, and they show the way in which it is achieved. They initiate a boy into the discipline which is so essential a part achievement. They train him in sensiti craftsmanship, in higher ideals and aim They can even stimulate his ambition an lift his ability. Their slightly higher co when compared with their value and the use, is as nothing in this important wor the making of a man.

EUGENE DIETZGEN CO.

Chicago • New York • Pittsburgh • San Francisco • Milwauk
Los Angeles • Philadelphia • Washington • New Orlea

Dealers in All Principal Cities

***World Famous Quality* DRAFTING INSTRUMENTS**

Dietzgen Drawing Instruments are manufactured in a wide array of styles, grades and assortments to meet the purse and service needs of everyone from the beginner to the professional draftsman and scientist. Regardless of price, the name Dietzgen always identifies a greater value.

DIETZGEN *EVERYTHING FOR DRAFTIN AND SURVEYING*

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

VOL. 30 JANUARY, 1941 No. 1

As 1941 is Ushered in

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION wishes and hopes that 1941 will bring to its readers health, contentment, and spiritual well-being.

The February Issue

In order to help shop teachers in preparing for the end of the first semester of the school year 1940–41, the February issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION will be a Testing Number which will bring to the readers as much information about testing and tests as space will permit.

It is hoped that this number of the magazine will answer a real need and that the tests will help make the additional burdens of the closing period of the first semester a little lighter.

The attention of shop teachers, who are interested in making use of tests of various kinds, also is called to the numerous offerings that have appeared in the volumes from 1935 to 1940. These can be easily located by referring to the subjects section of the respective indexes under the title, "Testing and Tests."

CONTENTS

Training Workers for Industrial Citizenship, Boyd C. Shafer and Willis E. Giese 1
Things to Think About, R. W. Selvidge 3
A Challenge to Industrial-Arts Education, Raymond B. McHenry 4
Material Control and Distribution, Joseph A. Schad 5
Modern Plastics, Arthur Dunham 7
Integration Through Co-ordination, Earl M. Bowler 9
How Australia Is Taking Care of the Defense Training Program 10
The Bridgeport National Defense Training Program, T. E. Keyes 11
Follow-up Study of Industrial-Arts Graduates, E. D. Meyer 11
A Course in Industrial Carpentry, Mark McMillin 13
Editorials 14
What Next?, Dean M. Schweickhard 15
Should Only Individual Instruction Be Used?, Claude H. Ewing 16
Properties, Selection, and Suitability of Woods for Woodworking, Donald G. Coleman 17

Testing and Tests

Industrial-Arts-Aeronautics Test, M. D. Caffin 20

Problems and Projects

Telephone Stand, Clifford B. Smith 22
Four Simple Projects for the Metalworker, William W. Wills and Delmar W. Olson 26
A Christmas Card Project, Raymond M. Alexander 26
Making Christmas Trees Safer 28
Rack for Reference Books and Pamphlets, William K. Nevard 28
Aluminum Trays, J. Ernest Kuehner 28
Flowers in Block Printing, May Lillian Lampe 29
Anvil, R. E. Murray 32
A Feather Airplane, Terence Vincent 33
Indian and Rodeo Vests, W. Ben. Hunt 33
Art Metalwork, V. P. Conners 34
Printing Teachers Give Views in Symposia, R. Randolph Karch 37
Inspection Lists for Industrial-Arts Shops, Hiram E. Jackson 38
Electrocoated Waterproof Abrasive Papers for Furniture Finishing, Ray A. Wigen and Louis Barocci 39

Personal News 40
Association News 40
New Publications 15A
Shop Equipment News 16A
News Notes 21A

Articles Indexed — The articles contained in the Magazine are regularly indexed in "The Readers' Guide to Periodical Literature," and "Education Index."

Entered Jan. 2, 1914, as second-class mail matter at Milwaukee, Wis., under Act of March 3, 1879. Copyright 1940, by the Bruce Publishing Co. Title registered as Trade Mark in U. S. Patent Office, Nov. 25, 1930. Published monthly except during July and August.

Subscription Information — Subscription price, $2.50 per year, payable in advance. Canadian postage, 50 cents, foreign countries, 50 cents. Copies not over three months old, 35 cents; more than three months, 50 cents. Notice for discontinuance of subscriptions must reach Publication Office in Milwaukee, at least fifteen days before date of expiration. Changes of address should invariably include old as well as new address. Complaint of nonreceipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.

Editorial Contributions — The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

The Magazine is on sale at Brentano's, New York; Wanamaker's, Philadelphia; Brentano's, Chicago; Phillippine Education Co., Manila, P. I.

PUBLISHED MONTHLY, EXCEPT DURING JULY AND AUGUST, BY THE BRUCE PUBLISHING COMPANY, 540 NORTH MILWAUKEE STREET, MILWAUKEE, WISCONSIN

Eastern Office: 330 W. 42nd St., New York, N. Y. — Western Office: 66 E. South Water St., Chicago, Ill.
Pacific Office: 580 Market St., San Francisco, Calif.

SAFE • HEAVY • STRONG

W-70
24" JIG SAW

Everyone benefits by the installation of Yates-American machines in the school shop. The student profits because they are easier to operate and adjust . . . are safer . . . are full size, the kind that industry uses. The instructor gains because their simplicity and ruggedness releases more time for teaching . . . less is required for supervision and maintenance. And of course, the school board benefits because they last longer and represent the best value for the money expended.

The W-70 Jig Saw has gained remarkable popularity in the school field. It is exceedingly flexible, operates with amazing smoothness and is safe in the hands of even the most inexperienced.

Great flexibility is obtained by the use of MULTISPEED Drive. This feature provides any rate of speed from 700 R.P.M. to 1800 R.P.M. by simply moving a convenient lever. The machine can be run at high speeds for straight cutting, then instantly retarded for intricate patterns.

The unusual smoothness of the saw results from perfect synchronization of the top and bottom plungers, and the rigidness of the heavy cast-iron frame.

The machine is safe because all moving parts are fully enclosed . . . there is no need to handle any belts or shift the motor . . . no bulky complicated devices obscure the vision or cast disturbing shadows in the operating zone.

Investigate! Write for full information.

YATES-AMERICAN MACHINE COMPANY • BELOIT, WISCONSIN

Short Talks on Wood

IDAHO WHITE PINE (*Pinus monticola*)

Botanically and physically a genuine white pine. Of great value commercially. Sometimes called Western White Pine. The wood is quite strong, light in weight, and of soft texture. Is straight-grained with small, sound knots. Relatively free from resin. Nails well, is easily worked, takes and holds a good finish. Stays in place with minimum dimension change. Light in color.

Widely used in the building field for siding, exterior and interior finish, cabinetwork, millwork and knotty paneling. Also used for boxes, crates, garden accessories and foundry patterns. It is the principal wood used in the manufacture of wooden matches in the United States.

Its range extends from southern British Columbia, over the northern Rocky Mountains, through the Coast Range and into southern Oregon. It is most abundant in Idaho, and adjacent parts of Montana and Washington. Grows best on exposed mineral soil. Must have sufficient light.

A tall, straight tree often 150 feet or more in height. Diameter is usually about 3 to 5 feet. Short branches form a narrow symmetrical crown.

The bark is broken into small, square blocks about 1 inch thick. It varies in color from cinnamon to grayish purple. The leaves (needles) grow in clusters of five and are 2 to 4 inches long. Pendulous cones, 5 to 10 inches long, hang from the branch tips. They are very slender, and mature at the end of the second summer.

To date, twenty-two brief articles similar to the one above and dealing with the more commonly used woods have appeared in these ads. As in the past, we continue to invite your suggestions as to the species of wood you would like featured in this series.

YATES-AMERICAN

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

Training Workers For Industrial Citizenship

BOYD C. SHAFER* and WILLIS E. GIESE**

If the United States is to continue to be a democracy its workers must take an increasing and more intelligent and informed part in government. There are over fifty million willing and able workers in the United States and these with their families comprise the great bulk of our 130 million inhabitants. Unless the United States becomes a dictatorship, then, these workers, skilled craftsmen and common laborers, farmers and farm laborers, domestic servants and clerks, will continue to influence the destinies of our nation through the election of government officials. If political democracy disappears it will be because the workers could not cope with the complexities of government and modern economic developments. As yet the problem of training workers, not only for a vocation but also for citizenship in our industrial world, has not been fully faced.

Kilpatrick[1] has said, "Vocational education cannot simply educate vocationally. It must consider 'prayerfully' what kind of system it has in view, what kind of economic system will absorb the workers." Dean Melby[2] of Northwestern University recently wrote, "We cannot build a new and better society until we recognize the weaknesses in our present society and have the inventiveness and courage to develop more effective and desirable social arrangements," and Professor Forkner,[3] of Columbia Teachers College, believes that industrial educators must add "What the worker thinks" to the old phrases of "What he knows" and "What he is able to do." Other industrial and adult educators have recognized these problems in the pages of professional magazines[4] but we believe too little has been done to formulate a definite program for, to use Ordway Tead's phrase, "training for industrial citizenship."

A high school course or two in socio-economic problems was no doubt sufficient to educate the worker in citizenship in the immediate past. A hundred years ago perhaps no education at all in economics, politics, and sociology was necessary. Then the worker knew his boss if he had one, knew who owned the small shop in which he worked, knew that if no jobs were available he could move west, and knew the few brands of goods he liked and bought from the independent merchant whom he knew and usually trusted. Today, however, the society in which men live has become immensely more complex and dynamic. Men have become more and more interdependent, less able to take care of themselves individually, and workers find less and less freedom in their work life. Only the blind cannot see that the changes that have taken place in industry have profound repercussions throughout every phase of society.

The worker's job and his personal life are conditioned by and contingent on the organization of society, and society in turn is dependent upon his efforts and his well-being. For his own welfare and that of society, then, the worker of today should, (1) be able to see industrial society in perspective so that he may plan his own work life and promotional travel, (2) have as much knowledge as possible of the processes and human results of the economic system in order that he may intelligently view the economic and political aspects of society and consciously aid in the solution of economic and political problems, and (3) become an intelligent consumer of industrial goods so that the level of his and society's plane of living may be raised.

Vocational education can, if it will, help acquaint the worker with the world in which he lives and enable him to help control it. In fact, vocational education is peculiarly fitted to give the worker this knowledge. Close to the industry which has transformed this world, it can show him the industrial structure and make its implications meaningful to him, and can also use facts and illustrations showing work life and worker problems. Occupational skills acquired in the shop or classroom can be related to the industry for which these skills are acquired and then to society as a whole. It is true that the industrial educator cannot become a teacher of social science. He cannot provide all or nearly all the desirable instruction in social affairs. In most educational systems the worker will obtain education in other social science courses as in government, in economics, in sociology. Vocational education cannot afford, however, to assume that the social sciences, even if given well, will orient the worker to society and enable him to preserve his present benefits as well as to help him understand the social order. Each worker should have some grasp of every one of the fundamental objectives listed in the foregoing. No opportunity should be lost in giving him information about these. Few workers or teachers, it is true, will ever obtain a complete understanding. The future comes, nevertheless, and the responsibility for a well-informed worker must be faced by vocational educators. They should not, and cannot set their standards low.

The accompanying chart outlines a definite content to use in planning socio-economic information for the industrial

*Social Science Department, The Stout Institute, Menomonie, Wis.

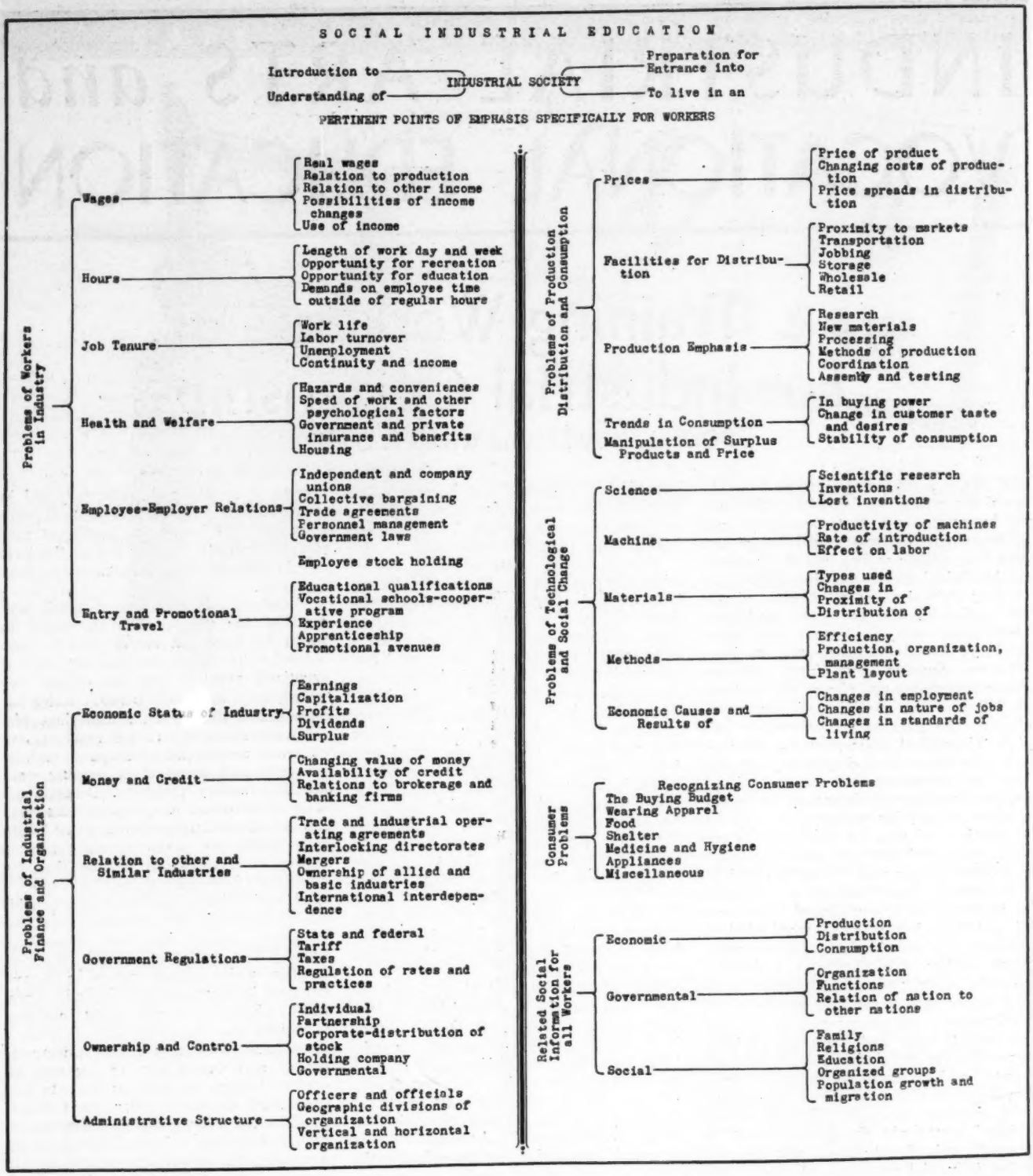
**Purdue University, West Lafayette, Ind.

[1]Kilpatrick, William, "Character and the New Society," *Occupations*, No. 5, Vol. 13, Feb., 1935.

[2]Melby, Ernest, "Administrators and Academic Freedom," *The American Teacher*, No. 5, Vol. 23, Feb., 1939.

[3]Forkner, Hamden, "Can Education for Vocational Pursuits Be More Than Training?," *The Social Frontier*, July, 1939.

[4]See for example: Busch, Henry, "Social Objectives of Guidance," *Occupations*, No. 9, Vol. 12, May, 1934; Reynolds, C. N., "Social Conditions and Trends," *Occupations*, No. 7, Vol. 12, March, 1934; Bowman, C. A., and Shafer, B. C., "Social Industrial Education," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, No. 11, Vol. 23, Nov., 1934; Tead, Ordway, "New Challenge to Industrial Education," *Social Frontier*, No. 1, Vol. 2, Oct., 1935; Prosser, C. A., *Vocational Education and Changing Conditions*, Bulletin 174, Department of Interior.



shop courses, for related shop courses, and for a study in the teacher-training institutions.

The worker may not care for, or understand, academic theorizing, but when a student is learning to be, let us say an electrician or an employee of the electric communications industry, he should be interested in the problems of all electrical workers. What jobs are available? How can he secure a job? Does the union control his job? Should he join the United Electrical Radio and Machine Workers, or the International Electrical Workers and Operators Union, or the American Communications Association? How does the United Construction Workers Organization Committee affect the electrician's union? Why do the electrician's union call its industry the "strikeless industry"? What is the attitude of the employer toward any particular union? What were the problems of the workers and management at the Toledo Auto-lite strike or the Milwaukee Allen-Bradley strike? These questions on labor problems should be meager samplings of what could be asked, for this topic is of

increasing importance with the present-day vitalized labor movement. Poorly informed workers may cause misunderstandings that are detrimental to themselves, to employers, and to society. And there are other questions equally important. Is it better to be a free-lance independent contractor, or repairman, rather than a skilled employee or a production worker who is subject to the rigid discipline of a mass-production system? Is there job security? What welfare and other services should the worker expect from industry and how may he best use those services? Are wages low or high and what are the wages expressed in terms of buying power? How could they be raised through cooperation of employees and management?

The new employee should be as selective in his occupational pursuits as the employer is in choosing his workers. Job satisfaction is a primary requisite for a full enjoyment of life and can best be brought about by knowing full well what is desired and where to come closest to meeting work-life ambitions. But job satisfaction alone is not enough. In the modern world a job may disappear. Thousands of men may be thrown out of jobs overnight. How can the worker help expand production, increase jobs, and elect officials who will protect and expand his security and opportunity?

The embryo electrician might well be made cognizant of industrial finance and organization by such questions as these: What is the relation of the job to government regulation of public utilities, to the production of cheaper electricity by such agencies as TVA, to the expansion of rural electrification through the REA, to the ownership and financial structure of the industry, and to the relation of the industry to society as a whole? How does worker compensation depend not only on skill but also on finance, management, and on ownership and corporate structure? What is the position and relationship of such large companies as General Electric and Westinghouse to the whole electrical industry? What are the functions and influence of such groups as: National Electric Manufacturers Association, National Electrical Contractors Association, Edison Electric Institute, Radio Manufacturers Association, and Federal Communications Commission?

Production, distribution, and consumption problems in the electrical world and in electric communications are of constant and vital importance. Consumption especially has been recently emphasized in all phases of education. Here the young potential electrician should be informed about still other questions: What services should I expect from the industry as a consumer? How may I best use these services? How must I manage my electrical business or job so as to meet the trends in consumer demands? Should I join a cooperative buying group, buy from a large distributor such as Graybar, or from a small local electrical jobber? What difference does it make to buy from a jobber 500 miles away at lower prices but with increased transportation costs or from a near-by jobber with perhaps higher prices? How can I best take advantage of cash discounts? How is the communication industry affected by the fact that there probably will be no need for new lines in order to expand the telegraph business? Does mass production improve the product or does it lower the cost?

Discussion of technological and social change will of necessity be distributed throughout almost any course. But a few direct questions present themselves: How will changes in technology affect jobs and production, costs, profits, and wages? Will motion and time studies help me as a worker, and if so, how? What possibilities are there that a machine can do the job better than a man? Should the introduction of the machine be encouraged or restrained? How will the improved facsimile system affect jobs, and customers in the telegraph business? As the worker studies these questions he will soon see that he cannot be satisfied with skill alone. The use of and compensation for his skill depend largely upon things outside himself, upon economic, political, and social forces which he must understand if he ever wants a better position in life for himself and his fellows.

Apparently simple questions concerning the worker's job thus lead him to dozens of other aspects of society. Activated by his individual desire the worker begins to understand that society is complex and interdependent. This alone is the beginning of real social wisdom and intelligence. Not only the industry but society as well gains. The worker sees his job in perspective. No one phase of industrial society, it must be repeated, can be understood without at least some knowledge of the other aspects. Suppose through his union the employee pushes up his wages so far as to cut into the capital of the business. The business would "go broke." Suppose on the other hand the profits (mostly savings) coming from industry are high and the wages (mostly consuming power) are low, then a depression may result because of nonproductive speculation, and wages along with employment will drop. Suppose again that the government makes the findings of an expanded bureau of standards available to the general public. The real wages of the worker will go up but some jobs in a few industries may be eliminated. Suppose again a holding company bill is passed that will be exceptionally stringent, or there is established a stronger federal control of communications or a public power project such as TVA takes over communications. Will rates go down and the real income of all the workers go up, or will the opposite occur?

To get the greatest possible number of satisfactions and the greatest possible security, the worker then, must be cognizant of the order in which he lives. Only so can he remain free, only so can he avoid the suppression actually occurring in Germany, Russia, and Italy, only so can he progress to new and better things, perhaps only so can he continue to live.

The employer and public are dependent also upon the workers' industrial citizenship, at least in so far as they are dependent on the constant flow of goods from the producer to the consumer. If this flow of goods is interrupted by, say, too much saving or by industrial conflict, all members of society suffer, the businessman loses his profits, the public's living standards are reduced, and many workers may lose some of their income. If the worker receives social-economic industrial education, however, industrial peace will be more likely and the consumption of goods will increase. It is to society's interest that the worker not only understand his job, but that he also be able to think clearly on all of these problems.

Progressive vocational education, then, it would seem, must partially consist in training workers to understand their industrial order and to develop socioeconomic frontier thinking and research. If it does these tasks it will help preserve the best of what we now have, and create an economic system where there is less economic insecurity and a higher level of job and life satisfactions. Vocational educators should take cognizance of their advantages for the training of desirable industrial citizens.

THINGS TO THINK ABOUT

R. W. Selvidge,
University of Missouri,
Columbia, Mo.

The most important thing in guidance is to develop in the youth a strong desire and determination to be something worth while that is sufficiently remote to be impossible of immediate realization. What he wishes to be is relatively unimportant so long as it is honorable and he is willing to make present sacrifices in order to attain it.

To discover the vocational interests of a youth is worth while but to discover whether he has the determination or the will to make the sacrifices necessary to attain these objectives is far more important.

Guidance should be something more than sympathetic twaddle and something less than an effort to sell a youth on some specific vocation.

Counselors and youth should understand that a satisfactory rating in an aptitude or vocational interest test does not assure success. Success is won only through hard and persistent labor and many sacrifices.

Individuals, like water, tend to seek their level and not many who are capable of success in the higher levels are found in the lower.

Passing fancy, or the desire for a spectacular and easy life, must not be mistaken for the true interest which is so deep and so fixed that the individual is willing to make continuous and persistent sacrifices to attain the goal. The best measure of interest is the degree of effort one is willing to put forth in order to attain his desire.

A Challenge to Industrial-Arts Education

RAYMOND B. McHENRY*

A study of the history of education reveals that all major changes in education are the direct results of current social and economic pressures. The Latin grammar school had its origin as a result of social pressure or demand for an educational institution suitable for training youth in the ministry. The academy was an outgrowth of a social demand for a more practical education, while the public high school was a result of society seeking a school to prepare youth to enter the universities and colleges of the time. Surely some social pressure must be active to stir such activities as are prevalent in the progressive education movement.

The progressive education or new curriculum movement in secondary education must be evaluated critically by industrial-arts education leaders and teachers. This critical evaluation is not necessary because of the philosophy of the progressive education movement, but because of the possible demanded changes in the educational service to be rendered through industrial-arts education.

It is evident that the new curriculum will involve a core arrangement — enlarged areas of instruction, the elimination of present department identities, and new methods of instruction. It seems only timely that the industrial-arts education leaders should weigh the dominant questions relative to the core curriculum critically. It would be well to explore and project the effect of the application of the changed curriculum to our jobs.

The core curriculum is defined as that part of the organized education of youth which pupils are required to pursue because of its crucial, frequent, and important need for proper social living. These needs shall be determined by the application of logical reasoning, analysis, and, if possible, scientific methods. It is reasonable to expect that these needs cannot be described by the names of the present departments in our schools. No doubt they will be included in a core offering similar to the ones shown in the center section of Figure 1.

Is industrial-arts education identified with these subdivisions of the new secondary school movement? Not as a unit, but industrial-arts education as it is now taught in the well-organized secondary school offers a direct contribution to each of these subdivisions of the core curriculum. These six broad areas will represent the general education necessary to adjust all youth in the secondary school to a democratic society unless those supporting industrial education can justify further subdivisions, additions, or the reidentifying of these areas.

In the right and left sections of Figure 1, are given some of the present contributions to secondary education through the teaching of industrial arts. The lines connecting these contributions to the proposed areas of the core curriculum reveal some of the contributions to the new curriculum that is at present provided for in the well-organized industrial-arts program. The relationship of the broad areas in the new core curriculum and the present contribution to education as shown in Figure 1 do not assure the maintenance of industrial arts in its present identity in the new curriculum. No doubt the laboratory of industries or a similar program will qualify in the core curriculum. The assumption that the present department identities must be removed and that broad areas of instruction will replace the smaller unit organization will necessarily imply flexibility of general nature, less emphasis on technical information, and more on self-creativeness, individual student analysis, emphasis on general social problems, and changes in the philosophies of secondary education.

The progressive education movement has chiefly the objective of offering secondary education to youth as a unit. Too much emphasis today in all education is toward offering training in small unorganized units. Progressive education will deal with major problems of social and economic importance. The proper solution of such problems is determined by the ability of youth to use the fundamental skills of learning. Needless to say, the solution of

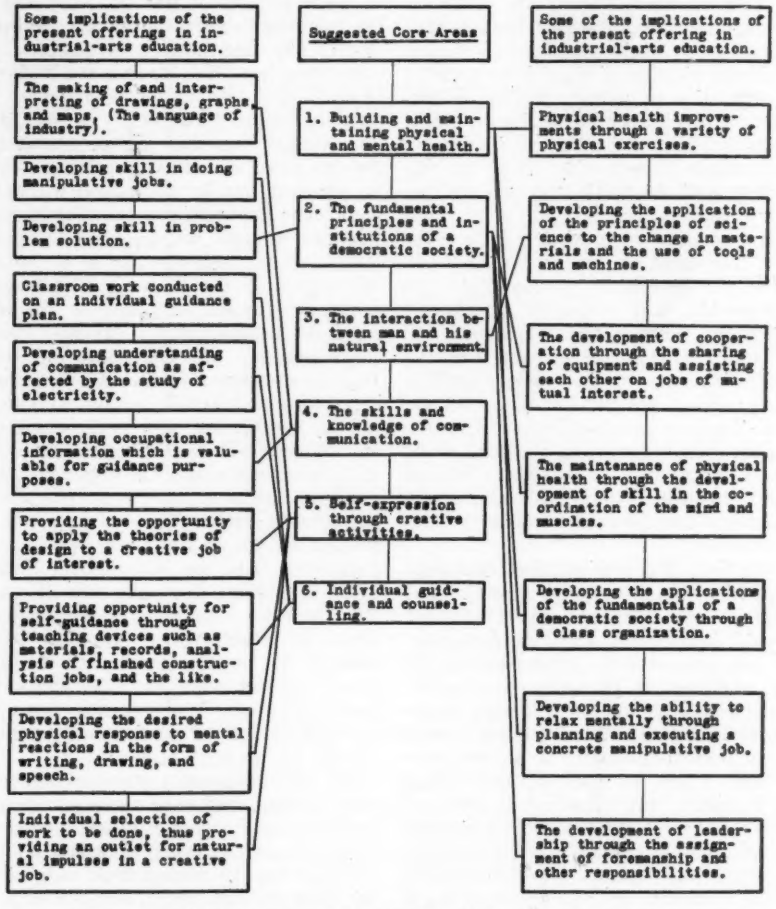

Some implications of the present offerings in industrial-arts education.
The making of and interpreting of drawings, graphs, and maps, (The language of industry).
Developing skill in doing manipulative jobs.
Developing skill in problem solution.
Classroom work conducted on an individual guidance plan.
Developing understanding of communication as affected by the study of electricity.
Developing occupational information which is valuable for guidance purposes.
Providing the opportunity to apply the theories of design to a creative job of interest.
Providing opportunity for self-guidance through teaching devices such as materials, records, analysis of finished construction jobs, and the like.
Developing the desired physical response to mental reactions in the form of writing, drawing, and speech.
Individual selection of work to be done, thus providing an outlet for natural impulses in a creative job.
Suggested Core Areas
1. Building and maintaining physical and mental health.
2. The fundamental principles and institutions of a democratic society.
3. The interaction between man and his natural environment.
4. The skills and knowledge of communication.
5. Self-expression through creative activities.
6. Individual guidance and counselling.
Some of the implications of the present offering in industrial-arts education.
Physical health improvements through a variety of physical exercises.
Developing the application of the principles of science to the change in materials and the use of tools and machines.
The development of cooperation through the sharing of equipment and assisting each other on jobs of mutual interest.
The maintenance of physical health through the development of skill in the coordination of the mind and muscles.
Developing the applications of the fundamentals of a democratic society through a class organization.
Developing the ability to relax mentally through planning and executing a concrete manipulative job.
The development of leadership through the assignment of foremanship and other responsibilities.

Fig. 1. The relationship of the present industrial offering to suggested core areas in the new curriculum

*Director, Public Schools, Fort Smith, Ark.

many major social problems will involve manipulative skills. Time is given in the general education plan for the teaching of the so-called tool subjects, such as arithmetic, spelling, grammar, reading, and the like. It is reasonable to expect that somewhere in the modernized scheme of education there will be allotted time for the teaching of the use of the mechanical tools, machine, and materials, which are so essential to know in seeking an understanding of the major problems of life.

Industrial-arts education of the future, to survive other than for the purpose of teaching the elementary skills to be used in the solution of the problems of the core areas, must meet the challenge by increasing the opportunity for a spread of occupational experiences, co-ordinated with a vast amount of related subject content. Thus the future offering in industrial-arts education will provide for:

1. An active interest in industrial life and the methods of production and distribution.
2. The development of consumer knowledge relative to the products of industry.
3. The development of the appreciation for good workmanship and pride in self-creative ability.
4. The development of a feeling of self-reliance and confidence in the ability to deal with other people.
5. The development of cooperation in life situations.
6. The development of orderly habits of procedure in doing work and the ability to budget time on a job.
7. The development of elementary skills in the use of the more common tools, machines, and materials of industries.
8. The development of the ability to apply the experiences gained in other school offerings toward the solution of practical industrial problem situations.
9. The development of skill in the application of logical reasoning in the solving of practical job problems.
10. The development of an understanding of the advantages and disadvantages inherent to certain lines of industrial activities.
11. The development of avocational interests.
12. A broad insight and understanding of information relative to industrial activities.

An industrial-arts offering in the public schools providing for the accomplishment of these and other similar objectives promises to become one of the core areas in the curriculum offering in the new curriculum.

Material Control and Distribution

JOSEPH A. SCHAD*

For several years the plan described here has been in operation in a comprehensive general shop and has proven very successful. There are eight executive officers who serve from six to nine weeks.** Three of the officers, the *general-stock foreman, supply clerk,* and *finishing-room foreman* are responsible for issuing all of the supplies used by the members of the class. Through a personal conference with the instructor, the officer becomes familiar with the special duties of his office, the location of the supplies, and the techniques of issuing materials to the pupils. Each officer is given a typewritten copy of his duties and a nickel-plated badge indicating his official position.

The duties of the *general-stock foreman* are:

1. Assumes the duties of the superintendent if he is absent.
2. Knows the content of the material directory and issues items marked GSF (general-stock foreman).
3. Issues the exact amount of material needed for the job or project when the student presents project record card for proper indorsement.
4. Weighs the various pieces of materials as they are cut from the stock sheet; sees that the information is recorded on the project record card, and inserts signature in proper column.
5. Notifies instructor when supplies are low.
6. Returns unused materials to stock room at the close of the period.
7. Keeps the stock room orderly.
8. Keeps the steel rack orderly.
9. Checks the arrangement of the sheet metals under the shop table.
10. Makes a report to the superintendent at the close of the period.

*High School, Newport News, Va.

**See "Shop Management and Control" — INDUSTRIAL ARTS AND VOCATIONAL EDUCATION MAGAZINE, March, 1938, p. 121.

The duties of the *supply clerk* are:

1. Knows the content of the material directory and issues items marked SC (supply clerk).
2. Issues exact quantity of material needed when pupil presents project record card for proper indorsement.
3. Renders prompt and courteous service.
4. Notifies instructor when supplies are low.
5. Keeps the parts cabinet orderly.
6. Makes a report to the superintendent at the close of the period.

The duties of the *finishing-room foreman* are:

1. Knows the content of the material directory and issues items marked FRF (finishing-room foreman).
2. Issues supplies upon presentation of a written requisition. Checks spelling on these requisitions.
3. Grants permission to work in the finishing room, limiting the number to three.
4. Inspects and approves the cleaning of brushes.
5. Sees that windows and doors are locked at dismissal time and turns off exhaust fan.
6. Checks the type of work done in the room.
7. Checks the arrangement of projects on the shelves.
8. Replenishes the cotton waste when necessary.
9. Sees that the worktables are cleaned at the end of the period.
10. Sees that the finishing-room cabinet is orderly.
11. Notifies the instructor when the supplies are running low.
12. Makes a report to the general superintendent at the close of the period.

The supplies are conveniently located; arranged according to kinds, sizes, and classifications and appropriately labeled. Galvanized iron and black sheet steel are stored on shelves under the long work benches; racks on the wall provide a place for the strap steel, pipe, and tubing. In the stock room are the lumber, plastics, pewter, copper, brass, acids, drawing paper, plywood, polishing cloths, and the bulk of the finishing-room supplies. These materials are under the supervision and control of the general-stock foreman. In the shop are two large steel cabinets, one known as the small parts cabinet; the other, the finishing-room cabinet. The former contains machine screws, sandpaper, solder, rivets, and the like. It is under the direct supervision of the supply clerk and only accessible to him. The cabinet for the finishing supplies is purposely located outside of the finishing room. In this location it is more convenient for the finishing room foreman and eliminates the temptation that certain individuals might have to obtain or return items to the cabinet. Thus, there is a definite place for each piece of material.

The material directory which follows is posted in the shop and has a fourfold purpose. It provides the pupil with information relative to the materials available, the thicknesses in stock, the title of the officer who issues a particular item and the unit price. The directory eliminates the "Where?" and "Who?" type of questions. For example, John desires to know who issues the sandpaper, rivets, solder, copper and the like; Harry wants to know where he can obtain more cutting oil, pewter flux, paste, drawing paper, and a countless number of other items. These questions are answered in the directory. Thus, much of the routine work is the responsibility of the individual and the student officer. The material directory solves a problem for the teacher and enables the instructor to devote more time to the teaching process.

In actual practice, the pupil procures

supplies in two ways. First, upon presentation of his project-record card to the proper student officer and secondly, by written requisition. Assume that a pupil has designed an octagonal sugar bowl and listed the required materials on the project record card (Fig. 1). The card is signed by the record clerk and instructor; then, the proper entry is made on the progression chart. The pupil consults the material directory and learns that pewter is distributed by the general-stock foreman, whereupon, he presents his card to this officer and obtains the pewter. The foreman weighs the metal, records the weight and signs the card in the space to the left of the item. Aluminum oxide cloth, solder, and steel wool are obtained from the supply clerk in a similar manner. Finishing materials are issued by the finishing-room foreman upon receipt of a written requisition (Fig. 2). In this instance, the pupil will need pumice and rottenstone, tripoli, rouge, and silver cream. Upon returning the materials to the foreman, the requisition forms are destroyed.

Among the questions that may be raised regarding the distribution of supplies through student officers are: first, "How much time is required to administer the duties?" It depends on the type of shop, the variety of activities, the duties, and experience of the officer and the level of the work. In our comprehensive general shop of four activities, meeting two periods daily, it averages about 8 minutes for the general-stock foreman, 10 minutes for the finishing-room foreman, and 4 minutes for the supply clerk in the elementary classes. In the advanced sections, the time element is considerably less although the range of activities is greater, varying from 4 to 8 units of work.

Secondly, "What is the procedure when one of the three officers who issues supplies is absent?" As the duties of the general superintendent are supervisory in nature, he assumes the responsibility. In most instances, the superintendent has had experience in several positions and is thoroughly familiar with the duties of the various officers.

Finally, "Does the officer accomplish more or less work than the average of the class?" Practically every boy is given an opportunity to serve as an officer and perhaps, in the final analysis, the work factor balances. Generally speaking, the executive officers lead the class in the quantity and quality of work produced.

"In evaluating this method of distributing supplies, what educational outcomes are realized?" The system provides valuable experiences for the realization of a major objective of education. Pupils accept responsibility willingly and manifest a spirit of cooperation; habits of orderliness and neatness prevail in all phases of the teaching situation. Reflection is stimulated because pupils are encouraged to suggest ways and means for improving the efficiency of the various shop-management problems.

As the officers feel a definite responsibility for the material under their supervision, wasteful practices of consumption are practically eliminated. Galvanized sheets are not found with sections removed from the center, nor do the boys obtain larger pieces of stock than the job requires. Materials are cut advantageously and miscellaneous items are issued in exact quantities. Pupil responsibility, then, is an important factor in successful management and should be encouraged.

In the final analysis, the administration of routine work such as the distribution of materials by student officers not only provides valuable educational experiences for the pupils, but enables the instructor to render more efficient service in the technique of actual teaching.

Material Directory

Item	Size	Officer	Cost	Item	Size	Officer	Cost
Acids		GSF		Cold-rolled steel	2 in. dia.	GSF	.06 lb.
Alcohol, denatured		FRF		Copper	1/32 in.	GSF	.30 lb.
Aluminum	1/32 in.	GSF	.30	Copper	1/16 in.	GSF	.30 lb.
Aluminum	1/16 in.	GSF	.30	Corrugated fasteners		SC	
Aluminum oxide cloth		SC	.01	Crocus cloth		SC	.01 strip
Aluminum oxide grains		SC		Cutting oil		FRF	
Black sheet steel	1/32 in.	GSF	.06 sq. ft.	Cypress	13/16 in.	GSF	.10 bd. ft.
Black sheet steel	1/16 in.	GSF	.12 sq. ft.	Drawing paper		Tool Room	
Black sheet steel	1/8 in.	GSF	.24 sq. ft.	Drawing paper (special)	11 by 15 in.	GSF	.01
Bolts	(see display chart)	SC	.003 each	Drawing paper (special)	15 by 22 in.	GSF	.02
Brass	1/32 in.	GSF	.30 lb.	Emery cloth	3/0	SC	.01 strip
Brass	1/16 in.	GSF	.30 lb.	Enamel	(see color chart)	FRF	
Bronze powder		FRF		Escutcheon tacks		SC	.001 each
Bushings, fiber	1/8 in.	SC	.01 each	Filler, paste		FRF	
Carbon paper		SC		Flint sandpaper	(see abrasive chart)	SC	.0025 each
Cold-rolled steel	1 in. dia.	GSF	.06 lb.				
Cold-rolled steel	1½ in. dia.	GSF	.06 lb.	Flux (soldering)		GSF	

Requisition

Name WILLIAM PHILLIPS

Date 9-27-39 Period B & C

Items
TRIPOLI
ROUGE
PUMICE STONE
ROTTON STONE
RUBBING PAD

Letter information neatly

Fig. 2

PROJECT RECORD CARD

Department of Industrial Arts — Comprehensive General Shop

Name WILLIAM PHILLIPS — Project OCTAGONAL SUGAR BOWL

Specifications TO BE MADE FROM NO. 18 GAUGE PEWTER WITH CAST HANDLES. BASE AND HANDLES TO BE SOLDERED TO BODY.

Instructor O.K. G.A.P.

Record Clerk O.K. R.

Date Started 9-11-39

Questions & Answers 9-25-39 G.A.P.

Estimated Time 25 HRS. Actual Time 31 HRS.

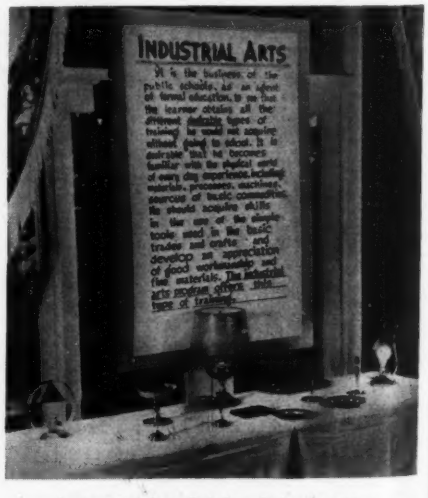
Date Finished 10-8-39

Division ADVANCED ART METAL

Final Grade 1- G.A.P.

O.K.	Quan.	Materials & Sizes	Cost
L.S.	1 PC.	No. 18 GA. PEWTER 4"x10"-6 OZ.	.24
L.S.	1 PC.	No. 18 GA. PEWTER 4"x4½"-3 OZ.	.12
L.S.	2 OZ.	SCRAP PEWTER FOR HANDLES	.08
K.B.	1	STRIP 60-40 SOLDER	XX
K.B.	1	STRIP 65-35 SOLDER	XX
K.B.	1	STRIP 70-30 SOLDER	XX
K.B.	1	STRIP No. 150 AL. OXIDE CLOTH	.01
K.B.	1	STRIP No. 80 AL. OXIDE CLOTH	.01
K.B.	1	STRIP CROCUS CLOTH	.01
R.J.		FINISHING MATERIALS	.03
		Letter all information neatly.	
		Total cost	.50

Fig. 1



Industrial Arts Exhibit. Submitted by John J. Buchanan, Maplewood, N. J.

Modern Plastics

ARTHUR DUNHAM*

"Plastics is a splendid material with which to work, but what additional tools and equipment must be purchased?" "A beautiful brooch indeed, but all you had to do was shine it up a bit, fasten a pin on the back, and the project was finished. How can you justify that in an industrial-arts program?" These and many other questions face the teacher, principal, and superintendent when considering the medium of plastics for industrial-arts and craft programs.

May we look once more to the scope of our field: "Industrial arts is a phase of general education that concerns itself with the materials, processes, and products of manufacture, and with the contribution of those engaged in industry."[1] It would be difficult to find a material more consistent with this definition. Conceived during the depression years, industrial uses for plastics have had exceedingly rapid growth. New products are constantly appearing on the market, old products are given new design and beauty, and an ever increasing stream of new uses are being found for the specific characteristics and beauties of plastics. One hesitates to cite latest developments knowing that within a short time they will be commonplace. One instance: recently a method known as extruded plastics has been developed whereby rods, tubes, and strips may be made into indefinite lengths. Hitherto plastics have been cast in molds thereby limiting the length of a form to about 24 in. A furniture manufacturer now weaves these strips into beautiful and highly serviceable rattan furniture which will never need refinishing, will not rust, and may be left in the rain or used by swimmers without deteriorating.

An Inventory is Needed

Analysis is desirable in any plan of teaching. This necessitates a thorough understanding by the instructor of materials and operations. There are things to teach, and right and safe ways to do certain things. Logically this brings us to the need of an analysis in order to make a ready identity of what to teach. Analysis (*a*) reduces the trade or subject to learning units in terms of operations and information topics, (*b*) there is selection of essential teaching units necessary to give learners the fundamentals of the subject, and (*c*) there can be arrangement of operations in relation to typical projects or jobs in such a manner as to proceed from the simpler jobs to the more complex. The accompanying partial analysis of plastics shows the operations listed from top to bottom and numbered successively. Jobs are listed across the top of the chart and numbered. The numbers in the squares refer to the operations at the left that are involved in a particular job. To illustrate: Job No. 1 is a napkin holder and under it are listed five operations. Job No. 3, a brooch, includes these five operations plus operation No. 6 — How to Cement a Finding. And so on, until as the learner progresses to Job No. 24 he will have learned the 20 operations involved. This chart is illustrative and does not assume rigidity of choice. Pupil choice, of course, is desirable.

AN ANALYSIS OF PLASTICS

Based on Operations

Operations	Jobs: 1 Napkin holder (opaque)	2 Shade pull (translucent)	3 Brooch	4 Ring	5 Bracelet	6 Cross	7 Switch plate	8 Letter opener	9 Blotter corners	10 Letter holder	11 Pencil & pen holder	12 Cigaret holder	13 Jewelry box	14 Ash tray	15 Name plate	16 Paper weight	17 Table centerpiece	18 Picture frame	19 House numbers	20 Table lamp	21 Dominoes	22 Chinese checkers	23 Desk memorandum	24 Desk lamp
1 Read a working drawing	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2 Make a plan of procedure	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3 Sand	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
4 Ash	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
5 Polish	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
6 Cement			6																					
7 Make layout				7	7		7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
8 Shape with file					8		8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
9 Drill with hand drill						9	9	9	9	9	9	9				9	9	9	9	9	9	9	9	9
10 Set finding						10																		
11 Saw with jeweler's saw							11	11				11		11	11	11	11						11	11
12 Saw with back saw								12	12	12	12	12	12	12	12	12	12	12		12	12	12	12	12
13 Fasten with drive screws									13	13	13	13						13						
14 Fasten with cement												14	14	14	14	14	14			14			14	14
15 Fasten with wood screws																	15	15	15				15	
16 Countersink a hole																	16	16	16					
17 Overlay																				17			17	
18 Vein with carving tool																					18	18		
20 Heat and form																							20	
21 Fasten with bolts																								21

Information Topics

Technical	General	Guidance
1 Grades of abrasive	1 History of plastics	1 Work opportunities
2 Color harmony	2 How plastics are made	2 Training needed
3 Kinds of plastics	3 Study of uses for plastics	3 Opportunities for advancement
4 Kinds and use of cement	4 Study of literature concerning plastics	
5 Sizes of drills and uses		
6 Shapes and sizes of stock plastics		
7 Files		
8 Tools for working plastics		

Information topics should involve three kinds of information; namely, *technical, general,* and *guidance.* Technical information is such information as is necessary for a learner to know in order to do the job properly. General information is knowledge that is related but is not essential to doing the job. For instance, it is well for a plastic craftsman to know something of the history of plastics but lack of such knowledge does not prevent him from being a very skillful craftsman. Guidance information should be an essential part of the study of a new material. Again the laboratory has been the means of creating industrial opportunities: what these opportunities are, qualifications, rewards, and the like, should be a part of each student's knowledge.

The operations involved in this analysis of plastics have been limited to hand-tool

*Sherrill School, Detroit, Mich.

[1]U.S. Department of the Interior, Office of Education, "Industrial Arts, Its Interpretation in American Schools." Bulletin No. 34 (Washington: Government Printing Office, 1937), p. 1.

processes because they are fundamental and practically every shop has the equipment. Although satisfactory results can be obtained by hand polishing, a buffer would be very useful and well worth the comparatively small extra cost.

Suggestions Regarding Operations

1. *How to read a working drawing*, and (2) *How to make a plan of procedure*, need no explanation here, however, these are learning units the student must master just as definitely as any operation. They are part of the job. They are of value in developing good thinking habits.

3. *How to Sand.* If the plastic materials are purchased from a dealer who cuts them to specifications you may request that he use an abrasive cutoff wheel thus leaving the edges comparatively smooth. Otherwise use coarse sandpaper to remove too marks. The scratches may then be removed with fine sandpaper — No. 4/0 to 6/0 and in the case of translucent plastics, No. 7/0 and 8/0. There is no grain in plastics and therefore it can be sanded in any direction. However, as succeeding finer grits are used scratches will be eradicated more easily by sanding at right angles to the previous direction.

4. *How to Ash.* After thorough sanding with the finest sandpaper, the next step in producing a finish is that of ashing or rubbing the plastic with a pad of No. 2/0 pumice and water. If a buffing wheel is used it should run at a speed of about 3000 f.p.m. Pumice is an abrasive, therefore care must be taken not to burn the plastic — especially the lighter colors. After the most minute scratches have disappeared and before the next operation, all pumice should be removed by rinsing in water.

5. *How to Polish.* If polishing by hand, proceed as above except use rottenstone as the polishing agent. Finally wipe the surface briskly with a clean dry cloth. Satisfactory results may be achieved in this manner but the task is rather long and arduous. If a buffer is available, mount three or four sections of unsewed buffing wheels on one side of the motor for the ashing operation. On the other side mount four sections for polishing. Apply buffing compound to the sections next to the motor and leave the outer sections clean. Apply the plastics to the inner side of the wheel thence across to the clean side. This will produce a high lustrous polish and bring out the beautiful color that is characteristic of plastics.

6. *How to Cement a Finding.* In the jewelry trade a finding is a support for an item of jewelry. The original method of setting a finding in plastics was to drill two holes, properly spaced, with a No. 55 drill. The finding was then held in place by driving two drivescrews (00 by ⅛ in.) into the holes. This method of fastening is very secure — if properly done — and should be used where great strength is required, as in holding the hinge for a split bracelet. However there are several objections: No. 55 drill is difficult for younger children to use in plastics because if stopped for an instant the plastic — heated and expanded while drilling — will cool just enough to contract and clinch the drill. These drills break easily and are expensive. Of necessity the brooch must be rather thick and thus heavy which is objectionable. Depth of hole is difficult to gauge with sufficient accuracy.

An attempt has been made to cement a finding in two sections. This has not proved satisfactory because the clasp will stick well enough but the unit with the pin attached is subject to too much leverage and eventually comes loose. The writer has developed a finding complete in one unit which can be easily applied by young students and holds satisfactorily. These are cemented in place with either plastic or Duco cement.

7. *How to Make a Layout.* As plastics come from the mold they are coated with a thin layer of wax. This must be removed by sanding with fine sandpaper before polishing. After this sanding is done the surface will clearly take pencil marks, transfers with carbon paper, and so on. For fine marking use a scratch awl or knife.

8. *How to Shape with a File.* A wood rasp or bastard file is used to remove a large amount of material followed by a smooth file to procure an even surface. A variety of differently formed files are recommended, because the file is an effective and much-used tool for shaping plastics, and the closer the file fits the surface being shaped, the better the result. The vise for holding the work should be faced with softwood vise jaws.

9. *How to Drill with a Hand Drill.* Metalworking drills are used for drilling plastics. It is necessary to clear the hole frequently. Care must be taken not to stop the drill in the material for the reason given under No. 6. If drills larger than ¼ in. are used they should be reground to give a slightly negative rake on the cutting lip. Otherwise the drill is likely to *hog in* causing the plastic to chop or split. For best results it is generally true that the cutting speeds be high and a fine cut made.

10. *How to Set a Finding.* In this instance it is necessary to drill a hole of sufficient size to allow a screw eye to be set. Plastics are soft enough that if a hole of proper size is drilled the screw eye will cut its own threads. Care must be taken that the hole is not too small or the plastics will split. These directions also apply to setting wood screws.

11. *How to Saw with a Jeweler's Saw.* The jeweler's saw is used for cutting curves in plastics as in art metal. We have found from experience that a blade with 32 teeth to the inch gives best results; fewer points than this may cause chipping along the edge. Although plastics consist of relatively soft material as compared with metal, it has the peculiar quality of dulling tools rapidly.

12. *How to Saw with a Backsaw.* Plastics may be sawed like wood by holding the work in a vise or by means of a bench hook.

13. *How to Fasten with Drivescrews.* Drivescrews are especially adaptable to fastening plastics. If a hole is drilled the proper size, the material is soft enough that threads are easily cut and the fastening securely made. This method of fastening is most often used for fastening wood or metal to plastics or where it would be difficult to remove excess cement.

14. *How to Fasten with Cement.* Special cement has been developed by manufacturers of plastics and if properly used will hold as securely as the material itself. When applied the cement causes the plastic to soften slightly so that when set the two pieces are fused or welded together. One type of cement is available which is transparent. This type is specially designed to be used for translucent plastics. Work should be set in clamps. Follow directions given by the manufacturer.

15. *How to Fasten with Wood Screws.* See No. 9 on how to set findings.

16. *How to Countersink a Hole.* A hole may be countersunk in plastics with a woodworking countersink or by using a large metalworking drill.

17. *How to Overlay.* An overlay is made by cementing a thin sheet of plastic over another for purposes of decoration or to add strength. Common finishes for wood edges are chamfer, bevel, and so on, but a plastic edge seems to appear to best advantage when simply rounded.

18. *How to Vein with a Carving Tool.* When a plastic surface is carved it presents a frosted appearance which may add to the decoration or design by contrast. The tang of a discarded file may be ground to form a carving tool. For safety, do not grind the tang until the file is discarded. Files should not be used without handles.

19. *How to Enamel a Recess.* A touch of decoration, design, or even efficiency may be added by veining a piece of plastic and filling the vein with enamel of a contrasting color. The appearance and efficiency of a cribbage board are considerably improved by this means. Fingernail polish, which can be purchased in many colors, is frequently used because it dries quickly.

20. *How to Heat and Form.* Plastics most adaptable to craftwork are called *theromsetting resinoids;* that is, once this type of plastics *sets* or hardens in its manufacture, it cannot be melted again. However, it can be softened by application of heat. This is usually accomplished in the shop by placing the plastic in water and heating the water from 150 to 200 deg. F. At this point the plastic becomes pliable and can be bent at will. Forms — both male and female — made of wood, or other suitable clamping devises are prepared in advance. Left to cool in a form the plastic will retain the new shape.

21. *How to Fasten with Bolts.* This means of fastening may be used when desirable and is done in the same manner as bolting pieces of metal together. It is well to use washers if possible because the

greater area covered adds to the strength of the fastening.

Materials Needed for the Jobs Listed

Sandpaper of various grades from No. 1/0 to 8/0.
Powdered pumice, grade 2/0.
Buffing compound or rottenstone.
¾-in. finding.
Neck chain.
Small screw eye.
Plastic cement.
Enamel of desired colors.
Drivescrews No. 00 by ⅛ in., 0 by ¼ in., and 4 by ½ in.
1-in. f.h. screws.
¾-in. r.h. screws.
R.h. bolts, nuts, and washers.

Tools and Equipment Needed to Carry Out Projects Listed

Vise.
Several assorted files — second cut and smooth; half round, needle, rattail, and so on.
Set of metalworking drills, including a No. 55.
Hand drill.
Jeweler's saw and 32-point blades.
Hammer.
Nail set.
Countersink.
Brace.
Carving tools.

An attempt has been made thus far to acquaint the teacher desiring to use plastics in industrial-arts or craft classes with the potentialities in the field of plastics,[2] an analysis of fundamental hand operations involved, specifically how to carry on these operations, and a list of typical projects.

References

Modern Plastics Magazine, edited by E. F. Lougee, 122 E. 42nd St., New York. The magazine of the plastics industry.
Selvidge, R. W. and Fryklund, Verne C., *Principles of Trade and Industrial Teaching* (Peoria, Ill.: The Manual Arts Press).
Mansperger, Dale E., and Pepper, Carson W., *Plastics, Problems and Processes* (Scranton, Pa.: International Textbook Co.).
Lockrey, A. J., *Plastics in the School and Home Workshop* (New York City: D. Van Nostrand Co., Inc.).

[2] Arthur Dunham, "Modern Plastics," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, XXVIII (May, 1940).

Integration Through Co-ordination

EARL M. BOWLER*

From the psychologist we learn that periods of transition and rapid change are attended by periods of mental unrest and uneasiness. Rapidly changing economic, political, and social conditions leave definite marks upon the adult mind, and not infrequently have these conditions left their reflected imprint on the minds of our young people. Experiences that merge and blend into a unified whole existence are indeed less shocking to the nervous system and mental make-up than a dash of this, a little of that, a change to this, and a swing to that.

The kindergarten has reduced the shock of school entrance for the very young, the junior high school has bridged the gap between the grades and the high school for the adolescent, and the junior college idea has aided the grown youth to orient himself in the ways of college life. The gap between the traditional school setup and the vocational or trade school has not been bridged by any newly devised school plant. Little thought or attention has been given the fact that here is a transition which not only includes a change of school plant or building but also a change in objectives for the student.

If the kindergarten, the junior high school, and the junior college have been necessary adjuncts to our school system, what of the need for something or someone to help bridge the gap between the traditional school and the vocational or trade school?

What of the transition that comes to the successfully trained vocational students who must enter the field of work? What of the trained worker on the job who finds himself confronted with some of the real problems of industry? What source of assistance will be of most help to him in solving problems of hours, wages, conduct, attitude, loyalty, cooperation, alliances, and the like? After all, these are but a few of the mental brickbats hurled at employed workers. How well student or worker stands up under the strain of changing conditions indicates how well the personality has been developed; how thoroughly the individual has been oriented in the ways of the work-a-day world; how completely the training program has been integrated and co-ordinated with conditions which are real. In other words, how well the individual can "take it" depends upon how well the replica of life given in the training program has been made an integral part of the trainee's make-up.

Because of the paucity of prevocational schools, pre-employment jobs, and premediated labor disputes, three gaps must be bridged in the lives of those who travel the road of vocational-school preparation to job entrance to success and promotion on the job. The vocational-school co-ordinator with "finger-tip" control of information most usable in solving problems of those who find themselves caught in the flux of changing school and working conditions, should bridge the gap. Certain personal qualities of a good co-ordinator and certain physical qualities of a good vocational school should form a bond which should cement the friendship between the student and the school. Through guidance, counsel, informal interviews, helpful suggestions, sound advice, and careful follow-up, the new arrival at the vocational school should be made to feel at home, at ease, attuned or adjusted to the new tempo. Here the co-ordinator can help to close the gap between the traditional school and the vocational school through personal contact.

Hardly has the new trainee been made to feel at home in his new surroundings before he must be informed of the world of work and its opportunities. This gives both the teacher and the co-ordinator an opportunity to drive home to the trainee that a change in objective has been brought about as a result of his having left the traditional school where grades and college entrance are the usual goals of attainment. This period of enlarging and expanding the trainee's knowledge of the world of work should be the time when the desired rapport between co-ordinator and student is attained.

As the time for placement draws near, the feeling of closeness and nearness should draw these two individuals together often for conferences on the problems confronting workers in the industrial world. It is the impressions that are made at this point that cause those young people who find themselves in trouble later in life to return again to the vocational school and its co-ordinator for sound advice in the solution of their more difficult problems.

In the mature workman it is how deep these early impressions have been made that will cause him to return once or a dozen times to the school and its co-ordinator for sound advice and wise counsel. Personality plays a great role in the bond that should be formed between worker and co-ordinator. The co-ordinator who listens well will find many who will talk. To unburden a man carrying a heavy mental load is of as much and more benefit to society than to unburden a man carrying a heavy physical load.

Have you ever completely exhausted the air from an inner tube? Try it some time, and if you are unsuccessful at completely exhausting the air, ask a tire repairman how it is done. A very definite technique is involved. Exhausting the pent-up feelings of a troubled fellow being requires more skill than letting the air out of an inner tube. The smile of encouragement, the verbal "pat on the back," the look of sympathy, the injection of a kindly word or phrase must be adroitly used to gain the necessary facts that will lead to a reasonable and logical solution of the problems at hand. Facts must be gathered carefully and skill-

*School of Vocational and Adult Education, Rhinelander, Wis.

fully; the process must be a painless, smooth-running affair engineered by the skilled interviewer without stiffness or formality.

One who bridges the gaps for young people must be able to use the facts gained through personal contact to work out reasonable and logical solutions to the problems at hand. Satisfactory end results are obtained only by those who can interview, analyze, and draw workable conclusions from the facts thus obtained. The ability to analyze is a very vital asset to any vocational instructor; it is an absolute necessity to the co-ordinator. Qualities of tact, diplomacy, leadership, address, ingenuity, and sympathy are necessary in the co-ordinator to bind him, the trainee, and the school together.

Periods of quick or violent change cause the human personality to twist, warp, and bend. Modern vocational schools and trade schools can mollify these periods of violent change for students or trained workers who come to them for guidance by employing skillful co-ordinators to bridge the gaps and instill confidence through sympathetic understanding, accurate diagnosis, wise counsel, sound advice, sensible training programs, and logical remedial treatment. Through carefully planned co-ordination we can arrive at a heretofore unknown concept of integration.

How Australia Is Taking Care of The Defense Training Program*

One phase of Aus.ralia's war effort is the provision of thousands of skilled tradesmen for the army, air force, munitions and aircraft factories. The air force needs fitters, electricians, radiomen, and instrument makers; the army needs auto mechanics, and other tradesmen; and the munitions and aircraft factories need precision toolmakers and machinists.

The states, which exclusively control education, have unreservedly placed their resources at the disposal of the Commonwealth. In nine months 8000 men have undertaken full-time courses of training varying from 12 to 24 weeks. Four thousand have completed courses, including 1500 in the last month.

The men, who must be at least 21 years old, receive a basic wage while training varying from £3 17*s.* to £4 5*s.* a week (about $12 to $14) and £6 a week (about $20) on completion. While these figures appear small in terms of American currency, they are equivalent to $20 to $25 and $30 a week.

Trainees undertake to serve the commonwealth for the duration of the war under a penalty not exceeding $300 for breach of agreement.

To put the training period to best advantage it is spent doing factory jobs, and producing tools and gauges. This wartime training scheme is superimposed on the normal needs of more than 100,000 day and night technical students, including apprentices. The schools are able to meet the situation only by using their workshops and laboratories 24 hours a day. Technical school teachers, engineers, trades-union officials, and employers are all cooperating enthusiastically. Engineers and union tradesmen are providing additional teaching strength, and have devised special textbooks to expedite training. Draftsmen have provided the necessary drawings. All these services have been given gratuitously.

The unions have agreed to place unskilled workmen over 21 in skilled work, instead of requiring them to serve apprenticeships. This concession has been granted on condition that these men will be the first to be displaced if it becomes necessary after the war. Employers are serving on the committees selecting the men for training.

While this scheme is a vital part of the war effort, it will be immensely valuable after the war in providing a vast body of skilled labor, facilitating great industrial development. Another benefit will be the tremendous improvement in the technical education system necessary, especially in the provision of equipment and buildings which have long been urgently needed.

For this purpose the Commonweath Government has provided $1,300,000. Much of the equipment needed is coming from the United States. Where new buildings are erected it will be as part of a plan to increase peacetime facilities.

A supplementary enterprise is a preenlistment education scheme for the Royal Australian Air Force, under which 6860 youngsters accepted for the air force, but not yet called up, study at 300 centers throughout the Commonwealth under 1300 honorary instructors. The purpose is instruction in mathematics and physics of prospective air-crew trainees at present unequal to the educational requirements of the service, and also instruction in navigation, meteorology, and the theory of flight. These classes will reduce considerably, the time formerly required to train air crews.

*Australian Associated Press.

James Denman Junior High School, San Francisco, Calif.

The Bridgeport National Defense Training Program

T. E. KEYES*

The turmoil in Europe has awakened the United States to rapid action. With the speed-up in American war industries, there has been created a shortage in skilled aircraft workers.

On May 13, 1940, at the Bridgeport State Trade School, Bridgeport, Conn., a course for sheet-metal workers and riveters was started with three shop instructors loaned to the state by the Vought-Sikorsky Co. Enrollment began with 10 trainees and within a week 35 were on the list. On July 29 two shifts were added to accommodate the greatly increasing demand by Vought-Sikorsky, so that the courses are now operating 24 hours a day. The first shift runs from 8 a.m. to 5 p.m., the second from 5 p.m. to midnight, and the third, from 12:15 a.m. to 7:30 a.m. Fifty trainees are accommodated by each shift. To carry on this program, nine more instructors were loaned to the State by Vought-Sikorsky Co. to augment the present teaching force.

On September 30 this movement had swelled to such proportions that all aircraft training equipment was moved to the south wing of the McKinley School, on Hollister Ave., Bridgeport. This school now has been turned over to the State Trade School for the duration of the defense training program. This building at present has six shops and two classrooms, accommodating 300 trainees, under the supervision and instruction of 18 instructors. Approximately 25 to 30 new trainees are enrolled each week to replace an equal number who are graduated from the 3 months' courses to enter the Vought-Sikorsky aircraft plant. Up to the present time over 250 men have graduated from the course and have been placed in employment.

All trainees are drawn from the Connecticut state employment office, which is affiliated with the United States employment service. At this office, applicants are interviewed and given mechanical aptitude tests. If these test results are satisfactory, applicants are sent to the Vought-Sikorsky plant for another interview and a physical examination. Those who pass these further examinations satisfactorily, return to the employment office where they are given letters of introduction admitting them to the trade school.

The three months' aircraft, riveting, and sheet-metal training courses, including the related subjects and shop courses, were formulated by a committee consisting of executives, prospective instructors, keymen from the Vought-Sikorsky plant, representatives from the Bridgeport State Trade School and members of the State Department of Education.

*State Trade School, Bridgeport, Conn.

Follow-Up Study of Industrial-Arts Graduates

E. D. MEYER*

The first class was graduated from the industrial-arts department of Oregon State College in June, 1915. During the quarter century that has elapsed and to the time of this study, no extensive effort had been made by the department to compile records of the number of its graduates, their progress, or their past or present occupations. Information of that kind has often been desired and the need for it prompted the study of which the following data seem to be of the most general interest.

The first class to graduate consisted of four men, namely: William Dolde, deceased; Oscar W. James; Luther A. King; Jesse W. Motley. Since that time a class has been graduated each year. The smallest class, two in number, was graduated in 1919; while 15 were graduated in 1929, 1939, 1940. Prior to the class of 1940, 209 men had been graduated from the department. Women students have been enrolled occasionally, but none has completed the graduation requirements of the department.

Careful study of the records of the registrar's office, the alumni association, and the industrial-arts department was made, and it is thought that the names of all graduates of the department are included in the study. Questionnaires were sent to 195 graduates. Six graduates were not located and their present whereabouts are unknown. More than 70 per cent of the questionnaires were completed and returned. Nine graduates have died since leaving college, the most recent death being that of Archie N. Pickard who died from injuries received in an automobile accident in June of this year.

The following data are based upon returned questionnaires, and it is hoped they will prove of general interest. The graduates who completed their work with a major in industrial-arts education have a salary range from $800 to $4,800 per year, with the greatest number receiving between $1,400 and $2,400 annually. There is a very definite trend toward salary increases during the first 20 years

	Graduates	*Per Cent*
Oregon	53	45
California	45	38
Washington ...	15	12
Arizona	2	1
Others	2	4
	117	100

LOCATION BY STATES OF INDUSTRIAL-ARTS EDUCATION GRADUATES

	Graduates	*Per Cent*
Teaching	82	70
Executive and Administrative	12	10
Combination of Teaching and Administrative Duties	12	10.5
Not Teaching..	11	9.5
	117	100

PRESENT OCCUPATIONS OF INDUSTRIAL-ARTS EDUCATION GRADUATES

	Graduates	*Per Cent*
Oregon	17	77
California	2	9.3
Washington ...	2	9.2
Arizona	1	4.5
	22	100

LOCATION BY STATES OF INDUSTRIAL ADMINISTRATION GRADUATES

*Oregon State College, Corvallis, Ore.

of the teacher's experience. The graduates from the industrial-administration program have a salary range from $625 to $4,800, with the greatest number receiving between $1,200 and $2,000. When comparing these figures, it must be remembered that none of these graduates has been out of college more then 10 years.

The foregoing table includes some very significant data. It shows that 90 per cent of those graduated from industrial-arts education curriculum who responded to the questionnaire are at present employed as teachers or in school administrative work.

	Graduates
Owner or Proprietor	3
Administrative — Executive	5
Sales	1
Contracting	1
Operation and Maintenance	6
Clerical	3
Inspection	1
Drafting	2
Student	1

PRESENT OCCUPATIONS OF INDUSTRIAL ADMINISTRATION GRADUATES

Returns show that teaching positions combining the subjects of woodwork and drawing still are more numerous than others among industrial-arts subjects. While some subjects, such as auto mechanics, seem to be losing favor, others are merging and the combination is of greater value to the student. Art metal, metal spinning, various types of electrical work, and printing are increasing in popularity as secondary school subjects now included in the work of industrial-arts teachers.

More than half of the graduates of industrial-arts education obtained their first position in schoolwork through the efforts of the Oregon State College Placement Bureau. The study showed that a similar employment service is needed for the graduates of the industrial-administration program and steps are being taken to organize it. The industrial-administration graduates indicated that work prior to graduation and direct inquiry from an employer procured positions for two thirds of the group. Seventy-five per cent of the industrial-arts graduates obtained their first employment in the specific or general field of their training. Sixty per cent of the returns showed that a distinct liking for industrial arts was the reason for selecting that field of training. The industrial-administration group showed a marked trend toward business management, manufacturing, and contracting.

A very interesting group of facts was brought out by a section of the questionnaire concerning the period when the students chose industrial-arts education or industrial administration as a vocation. Approximately 18 per cent made the choice during high school days, 24 per cent before entering college, 23 per cent during their freshman year, 19 per cent during the sophomore year, and 14 per cent during the junior year in college. These data show that the choice is usually made not later than the student's junior year. The large number who made the choice at the end of the freshman year did so largely through transfers from other schools on the campus, while those who made the choice during their junior year frequently did so because of transferring from another college in Oregon or elsewhere. Transfers from normal schools are quite numerous due to a need for four years of industrial-arts education to meet certification requirements. Many graduates from the department who are in the teaching profession are continuing their professional study to meet the increasing demands put upon them by their work. Ninety per cent of them were in positions which required them to continue study, either for higher degrees or higher certificates. Twenty-five per cent were required to do so by school authorities in order that they could obtain salary increases or promotion.

Eighty-four individuals had continued their study by attendance at summer sessions at this or other schools. The fact that 89 per cent of the graduates who are in the teaching profession have followed a planned program of study for self-improvement indicates a steady professional growth.

The younger students, usually undergraduates, often complain that too much time is devoted to the study of the cultural studies. More than 80 per cent of the graduates replied that the cultural studies were of sufficient value to warrant the time spent on them. Sixteen per cent said the cultural studies were *indispensable*. These findings seem to indicate that it is probably wise to leave the selection of the social studies to the discretion of the school authorities with the practical assurance that the students eventually will endorse the policy when maturity and experience have added weight to their judgment. Some asked that *more* art, economics, literature, and similar studies be required. It must be remembered that those who in their mature years wish for more of the cultural and less of the technical studies had ample opportunity to pursue them as electives during their college days and did not avail themselves of the opportunity.

When asked to rank the professional, scientific, cultural, and technical groups of studies according to the values placed upon them, the following rating was given:

Professional	20.5 per cent
Scientific	4.3
Cultural	1.2
Technical	74.0

Graduates of the industrial-arts-education curriculum are, as a whole, quite happy in their work if their answers to the questionnaire are valid criteria. Eighty-eight per cent are satisfied with their positions, though several indicated that prospects for promotion were not too bright. Only four graduates expressed a dislike for teaching after having given it a fair trial. Ninety-six per cent of the returns expressed happiness that they had prepared for and followed the teaching of industrial arts.

A question that brought remarkable returns was that which asked the graduate to express his opinion of the extent of proper professional and technical training obtained from his college program. More than 75 per cent replied that their preparation was either good or excellent and an additional 15 per cent that it was reasonably good.

While the question just referred to, concerns the *extent* of *all professional* and *technical* training, another asked for the graduate's judgment of the quality and sufficiency of the *industrial-arts* program. Eighty-five per cent of the answers were that it was either "good" or "excellent."

Participation in collegiate activities showed that school clubs, fraternity life, and athletics, in the order named were the most important extracurricular activities, with music and publications next in order. It was interesting to learn that the total number who participated in the following five activities — debate, publications, journalism, drama, and music — was greater than for either athletics, fraternity life, or school clubs.

When asked to indicate the source of financial support while in college, the following figures tell the story.

Not dependent upon self to any degree	3.9 per cent
Less than half self-supporting	17.3
More than half self-supporting	33.1
Entirely self-supporting	45.

The figures seem to indicate that industrial-arts students as a lot are willing workers who are able to perform tasks for which industry and the public are willing to compensate them to an extent that will provide more than half of the money necessary for their college education.

CHRISTMAS SEALS

Help to Protect Your Home from Tuberculosis

A Course in Industrial Carpentry

MARK McMILLIN*

The trade school which was established as a part of the senior high school, San Bernardino, Calif., has as its aim to train students for positions in industry. Among the many courses offered, some for girls and some for boys, the course in carpentry is particularly interesting as it combines a routine drill in woodworking with actual experience in remodeling old houses and building new ones.

Physical requirements for enrollment are rather stringent, as the school expects to train only those boys who show definite promise of attaining success in the trade. An applicant for the course must be between the ages of 16 and 22, physically sound, of average height, have good eyesight, possess aptitude for mechanics and accuracy, and present a neat personal appearance. As for education, tenth grade completion is sufficient, but high school graduation is highly recommended, with a strong background of arithmetic and drawing as a necessity.

The training program for apprentices requires twenty months for completion, at which time the enrollee may enter the trade as an advanced apprentice. As for the course itself, the activities are taken up in progressive order, advancing from the simple to the more complex, all work being done on an individual basis so that progress accords with individual ability. If the enrollee has had previous training in school or in industry, his vocational training will begin at the point from which he can carry on.

*Senior High School, San Bernardino, Calif.

Course of Study in Industrial Carpentry

Industrial Relations

1. Materials of the trade: source, manufacture, distribution, specifications, costs.
2. Tools, operations and processes of the trade, social science, especially that phase which affects the worker and his relationships with other workers.
3. Working conditions, hours, pay, seasonal employment, health, recreation, morale, worker's responsibility for these conditions.
4. Health — personal and social hygiene, vital facts every craftsman should know about his well-being.
5. Industrial development — the growth of the industry, its scope, and trends; other industries that support it; its relation to other industries; how it is organized; how it is supported; importance of time and cost records.
6. Industrial organizations, trade, labor, and employer; what their functions are, and the worker's responsibilities to each.
7. Shop relationships, concerning fellow workers and the boss on and off the job; how these affect efficiency and happiness of the worker.
8. Laws and ordinances, city, county, state, and federal, and their effect on the worker, his job, trade, and industry; workman's compensation, unemployment, social security, safety.
9. Public relations — those factors having to do with consumer interest, confidence, honest work, fairness in dealings, loyalty to job and to the employer.
10. Personality characteristics, attitudes, and habits that should be developed to make a successful craftsman, responsibility as a craftsman and citizen to join with others in promoting better working conditions for all, and the civic and social welfare of the community.

Carpenter's Apprentice Training Program (twenty months)

1. Ability to do such jobs as:

(Continued on page 16)

Fig. 1. These carpenter apprentices visit a small lumber yard to learn how to evaluate lumber, and recognize faults

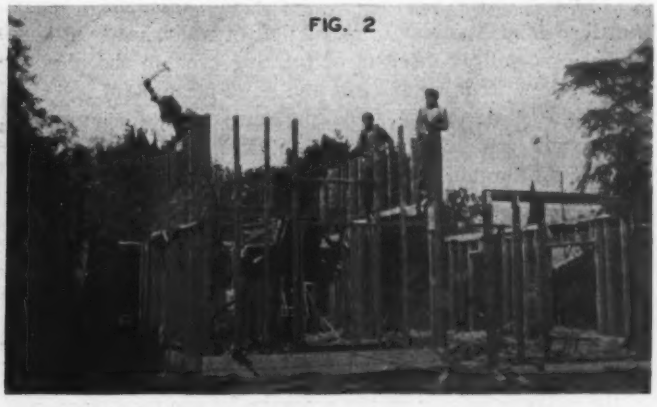


Fig. 2. Wrecking old houses and salvaging the usable lumber

Fig. 3. Measuring off the location of the foundation for a new house to be built on the school campus

Fig. 4. In order to receive training in renovating and modernizing, the boys completely refinished this home

INDUSTRIAL ARTS and VOCATIONAL EDUCATION
John J. Metz, Editor

PRINTING EDUCATION WEEK

On January 17, 1941, the 235th anniversary of the birth of Benjamin Franklin will be celebrated. To commemorate this, the members of the National Graphic Arts Education Association have designated the week of January 12 to 18 as Annual Printing week. They are also making strenuous efforts to declare Franklin Day a national holiday.

The printing instructors, who have formed this National Graphic Arts Education Association, are seemingly quite proud of the subject which they are teaching and of Benjamin Franklin whom they have chosen as their special patron. They are striving to show the world what the printing craft stands for, and they are doing something about having America pay special honor to one who has done so much not only for their craft, but in a scientific and civic sense as well.

One cannot help but hope that they will be successful. Incidentally, it might be wise for teachers of other subjects to study the methods employed by these printing teachers, who, in order to upgrade themselves and their work, have developed a very active national organization; have developed a student's graphic-arts society which has branches in the print shops of the schools all over the country; have fostered one or more projects each year, such as essay contests, research projects, and their annual notebook contest; all of which tends to keep students as well as teachers of printing ever on the alert to make their work more efficient and more meaningful.

For the year 1940–41, the national association research project will consist of an effort to set up model courses of printing on the junior high, senior high, and vocational school levels. Last year the project consisted of developing a composite analysis of the printing trades. Projects such as these are extremely valuable for all teachers of the subject and the energy displayed by the committees appointed to work on these projects is commendable to say the least. The print-shop instructors also keep close contact with the commercial printing field, and many of the most outstanding men in various phases of the industry appear on the programs of the local, sectional, and national printing-teachers' association meetings, giving them the fruits gained by the industry through practical experiences, and demonstrating to them the newer processes and machinery developed by inventive geniuses.

The teachers of printing are setting an example worth following. Their efforts might well be copied by the teachers in other fields of industrial arts and vocational education. The symposia on various phases of the printing trades which appear in this and past issues of this magazine ought to be studied by all shop teachers because they point out how to determine the what and why of subject matter for the various types of industrial arts and vocational education.

In the meantime, the printing instructors are to be congratulated. They are working hard to improve their own status, they are setting a fine example for others, and they richly deserve success in their undertakings.

When this issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION reaches the hands of the reader, it will still be a week before Christmas, and for that reason, we may be pardoned if in the January, 1941, issue we still speak about Christmas and what it stands for.

CHRISTMAS AND THE NEW YEAR

Accustomed as we have been from childhood to look forward to this feast of universal joy and happiness, and knowing that it is celebrated to commemorate the birth of the Prince of Peace, one cannot help but ponder on the fact that the coming Christmas will be far from being happy for countless numbers of people in Europe, Asia, and Africa, and yet He was born into the world to bring peace to all men.

The world has gone far in subduing the forces of nature. Man has accomplished much in wresting from his surroundings an understanding of the laws which underlie natural phenomena. He has delved deeply into science and has made wonderful progress in invention. With this progress in the direction of greater scientific knowledge, he seems to have overlooked the need of things spiritual, and the great lesson brought to us by the Master Teacher 1940 years ago has apparently been taught in vain.

Selfishness and greed are rampant, and for the sake of power and gold, men are cruelly slaughtered at the behest of dictators who, if they have ever heard the beautiful story of Bethlehem, overlook entirely the lesson it taught.

Under such dismal conditions, brought about by man's egotistical shortsightedness, it may be well to think about the responsibility which present conditions lay upon the shoulders of those in whose hands rest the education of the young. All about us are evidences of forces that have wormed their way into positions of trust and influence with the avowed intention of disrupting the democratic form of government under which America has made such progress, and under which its people have developed a standard of living unknown anywhere else.

It may be well also to critically study how teachers of industrial arts and vocational education can help their fellow teachers in the other subjects to instill into American students a love for our country which will be sufficiently strong to resist the boring from within which will otherwise rob us of the freedom which our forefathers gained for us at such great cost. Let us also prayerfully strive to do what we can to keep our youth out of the chaos now raging in other parts of the world.

As we approach Christmas and the beginning of the new year, our wish then is, that peace may soon be established among all nations, and that our country may enjoy a new era of tranquillity and prosperity.

AN INTERESTING BIT OF INFORMATION

The National Defense Program is placing quite a burden upon America's productive capacity. For this reason industry is doing its utmost to discover how to speed up production.

In this connection an interesting method was perfected recently when a means of welding armor plate was discovered. Previously it was commonly held that this plate could not be welded. This fortunate development signifies that hereafter military tanks will not only be produced by the quicker method of welding, but they will also be more rugged and strong.

The new method will be further utilized in the production of vessels for the navy, aircraft of many kinds, artillery, and for many other military uses. It will, however, also find extensive use in industry and the savings made possible with it will help produce peacetime goods at lower costs later on.

WHAT NEXT?

DEAN M. SCHWEICKHARD*

An Ever Present Question

Every transition in human thought or experience carries with it a sense of uncertainty as to the possible outcome. The parents of a child are constantly formulating and frequently voicing such questions as: "What will he do next which is pleasing or displeasing? What will his next report card show? What sort of danger will he be subjected to? What disease will he contract? Or what outstanding accomplishment will he master?" With men in business, in public life, and in any individual or group undertaking, the question always present, but never satisfactorily answered until the time comes, is: "What will tomorrow, next week, next month, or next year bring forth?"

In the school shop, laboratory, sewing room, cooking room, library, art room, music room, or wherever there are things to be done, the question repeatedly put to the teacher by students unfamiliar with the procedure expected of them is: "What shall I do next?" The well-prepared teacher and the inquiring student with the right attitude together find the way to a satisfactory and profitable answer which then becomes a part of the learner's permanent equipment. Sometimes a pupil seeks to find the answer by some sort of short cut or other, but is likely to find himself in a tight place sooner or later.

The steady increase of technical processes, scientific devices, and improved methods of procedure brings into more common use instruction sheets of various kinds. They are devised by the instructor in school, the manufacturer, the salesman, and the radio broadcaster. They appear as though they had come into being with little effort, and when given orally roll smoothly off the tongue. On the contrary the one who prepared each sheet of instructions or plan of procedure has asked himself as each step has been completed, "What comes next?" Following this, he has either answered his own question or secured the answer from sources outside himself. Asking the question is commonplace, but the manner in which the answer is found is significant.

Thinking or asking this universal question implies one of four possible states of mind. First, there is the mind that looks with fear, apprehension, and discouragement upon what the future may hold. Second, the foremost feeling may be one of dissatisfaction with things as they have been, and a dismal hope that what is coming may be more satisfactory. The third kind of attitude may be one of just plain curiosity as to what may lie in the future. The fourth state of mind is one of aggressiveness in looking ahead and determining to throw one's energy and ability into the active improvement of conditions within or without oneself.

One may have native inclinations toward certain of these states of mind, but a little attention and voluntary exercise will go a long way toward acquiring the one to be desired. The first step perhaps is a little introspective observation to discover in which state one most frequently finds himself. Then comes the period and process of change and readjustment.

Some Pertinent Applications

Now and then someone concludes hopelessly that all the inventions have been perfected and all the discoveries made. Such a one says in substance: "There is nothing left to do next." No one has a right to draw such a conclusion until he is able to tell what is to be done next in the following matters and some besides: (1) for youth or by youth; (2) about unemployment; (3) in matters of defense; (4) in social security; (5) in schools; (6) in building solid American patriotism; (7) in many aspects of industry; (8) in the field of inventions; (9) in scientific advancement; (10) in personal and public health; and (11) in cooperation, which means a greater degree of pulling together.

The occasional pupil who may have thought that school was a dull and uninteresting place should pause to ask himself, "If not school, then what next?" Clear-sighted attention turned back upon the school will reveal the fact that all systematic education or training is based upon *something next*, and is taking the necessary steps to proceed logically toward that something.

Citizens who take account of developments in the schools of their community are always wondering what will come next. Some of them are asking: "What new thing will the schools try next to add to the taxpayer's burden?" Their state of mind is largely one of apprehension. In the minds of those more interested in the improvement of their schools the query takes the form: "What is the next step for the schools to take in order to more adequately perform their constantly increasing responsibility?" This increasing responsibility seems to lie in three distinct directions: (1) in supplying appropriate opportunities equivalent to those formerly available outside the school — *frontiers* so to speak; (2) in bringing about substantial personal adjustment in the midst of complex circumstances; and (3) in vocational education either completed or in the process.

A succession of events in the field of industrial activity may serve to illustrate the transition which may take place in any field of practice, together with its accompanying change in the state of public mind. First, there was handwork because of necessity accompanied with the attendant discipline of circumstances. Next came a period where the desire was for leisure without handwork, based largely on a feeling of fake security and wishful thinking. This was followed by the stage wherein it has become popular to occupy leisure time constructively with handwork, which seems to mean that idealism is coming to be expressed through facing reality.

Constructive Implications

If one is inclined to be fearful, dismally hopeful, or just curious about the future he need only remind himself that what comes next will depend upon a threefold combination of: (1) what the individual himself does next, (2) what other people do next, and (3) what comes about through the forces of nature beyond anyone's control. There is little to do about storm, flood, or earthquake, except to be prepared in case of their sudden appearance, but the person who knows best what to do next even in such instances is the one who is most likely to survive.

In the relationship between self and others, one may be sure that if he sits idly by waiting to see what comes next, many others will be busy taking a hand in the shaping of that next something. Willingness to take some initiative in helping to determine what shall come next indicates self-confidence, which naturally must be based upon past accomplishments. Furthermore, the best way to insure a good next step is to make the present one secure, just as the mountain climber does in his laborious upward climb.

Every young person who looks out upon life hopes for success, and everyone in later life who has not already done so hopes to achieve it some day. Toward that end it is well to remember that the person who *succeeds* is the one who knows what to do next, and proceeds to do it. This holds true in an examination, a game of checkers or chess, a business deal, a boxing match, a project in the school shop, in a military conflict, and even in courtship.

Youth fired with ambition is ever eager to be of service. In this realm as well he can *serve* most effectively who knows best what to do next. He is indispensable in case of any accident, when the boat springs a leak, someone severs an artery, the house catches fire, someone faints, when the sink drain gets clogged, an electric fuse blows out, or when a lady is in distress.

The foundation for knowing what to do next, of course, lies in a sound background of knowledge and skill, but the secret of choosing quickly and well lies in *imagination*. Imagination is the very germ of

*Assistant Superintendent of Schools, Minneapolis, Minn.

what comes next in all human affairs. The laws of nature are facts; man's knowledge of these laws come through discovery; but their application to man's uses and devices is the product of imagination.

Standing at the threshold between what now is and what is to come next always represents a crisis of minor or major proportions. This is particularly true at the opening of a new year. It is said that in the Chinese language the word crisis is represented by two characters, one meaning *danger*, the other meaning *opportunity*. How well we are able to pull out of any crisis depends largely upon which of these elements stands out more prominently. If we are to make a progressive next step in any time of crisis we must be fully aware of the elements of danger, but just as truly must we be alert to the opportunities.

A COURSE IN INDUSTRIAL CARPENTRY

(Concluded from page 13)

a) Compute necessary mathematical problems.
b) Fit and hang C.C. and inside doors.
c) Fit and hang a double-acting door.
d) Fit and hang a casement sash.
e) Fit and hang a double-hung window.
f) Fit and nail baseboard and shoe.
g) Fit and nail cornice and picture molding.
h) Fit and apply inside door locks.
i) Fit and apply casement sash and window fasteners.
j) Fit and apply inside door butts and hinges.
k) Fit and apply door catches.
l) Lay out common hip, valley, and jack rafters.
m) Lay out walls and partitions.
n) Lay out door and window openings.
o) Lay out building, using builders' transit.
p) Lay out window and story poles.
q) Lay out straight-stair stringer.
r) Make necessary sketches.
s) Read and interpret blueprints and specifications.
t) Draw plans for foundation, floor, elevations, sections, and details.

2. Ability to understand facts and principles of:
a) Selecting the various kinds of lumber and knowing their properties.
b) Blueprints and specifications as related to construction work, embracing material, openings, plumbing, and electrical symbols.
c) Floor plan, foundation plan, elevations, and section drawings as related to construction work.
d) Building ordinances as required for the construction of buildings.
e) Federal Housing Administration specifications and rules.
f) Proper care of tools and equipment.
g) Relationships between the carpenter's work and the work of other craftsmen employed on the job.
h) Safety precautions necessary to preserve self and fellow workmen, and to conserve materials and equipment.
i) Taking off a bill of materials such as lumber, millwork, hardware, concrete.
j) Lumber manufacturing processes.
k) Tree growth and its preparation for lumber.
l) Manufacture of millwork.
m) Different kinds of hardware and their finish.
n) First-aid procedure in case of accident in shop or on the job.

3. Ability to understand and appreciate industrial relations with all of their implications and ramifications.
a) Those industrial relations previously outlined, as they apply to and become pertinent to this employment level.

Should Only Individual Instruction Be Used?

CLAUDE H. EWING*

One of the tenets of vocational education is individual instruction. The pupil is to be allowed to start a course at any time, go as fast as he is able, complete his work as soon as he can, and never retard his progress by demanding that he adjust his pace to that of his slower brother.

Although one may agree that this is a large order, yet vocational schools not only claim that they can do this, but they actually make it possible for each individual to progress as fast and as far according to his ability. It may be well to stop and consider whether totally individualized instruction may not be detrimental to the student. If individual instruction is carried to the nth degree, so to speak, each student will be entirely cut off from social contact with other members of his school group. He will enter the classroom at the specified time; read the instructions for the job on hand; secure additional information; obtain tools, equipment, and materials; plan the procedure, or follow specified directions; and complete his assignment without necessity for, or opportunity to compare his work with a fellow worker. It will be merely accidental if he is doing the same job as a fellow worker.

The things gained by this situation are: no time has been lost due to a slow fellow pupil; the sequence of work is kept; each individual plans and executes his own assignment; and no false idea has been gained by copying from someone who has not been able to interpret the instruction, or complete the work according to an acceptable standard. All of these things are good for the fast or more able student, but how many of the group are fast? If the normal distribution is considered, the individual setup is for the few more capable pupils. This is one of the things for which academic teachers have been condemned.

Although the goal of vocational education is to turn out the most capable mechanic in the shortest possible time, it must not be overlooked that the social economic changes which are constantly taking place must also be considered. Shorter working hours, less hand labor, and other often enumerated changes demand better socially trained workers. Then, too, more time is now available for the vocational training of youth.

To meet the demands for better socially trained workers, it appears that there may be something lost in throwing aside the group instruction for individual instruction. Assuming that a few individuals are retarded by group instruction, there is still plenty of time for training most pupils. It may be heard from all sides that there is nothing for youth to do when he does complete school, and the last years proved this statement to be only too true.

It may be well then to consider what may be gained by group instruction. Two or more pupils may talk over the procedure for doing an assignment; one may give the other a new or different interpretation of the procedure to use, or the work to be done. They have something to talk about, to plan together, to do together, and they obtain results which they may compare together. One aids the other, stimulates him to justify his own notion of the procedure or of the work to be done.

One student can compare his own ability with that of others. This gives him an opportunity to make needed adjustments. He obtains an understanding of the necessity to utilize his ability to the fullest extent so as to measure up to the more able individual. The gain in social adjustment made through group instruction may affect the loss of vocational time or progress on the part of a few. Two or more youths working on the same job have something in common. It may be a subject for discussion which will cause some development on the part of each.

As will happen in any group, certain individuals will lead and others will follow. However, leaders are needed and so are followers and the question is, does the school fail to make good leaders or good followers, if the individual instruction procedure is followed too closely.

In the industrial world there is need for workers who are capable of directing the work of others. This is true on all levels. To attain this ability, more than skill of performance to standard is needed. The

*Washburne Trade School, Chicago, Ill.

social adjustment needed to be able to receive and give instructions is essential. A program of instruction based entirely upon individual instruction may fail to aid in social adjustment. It is time to give some thought to this question and to vary procedures so that both the vocational as well as the social progress of the student be achieved.

Properties, Selection, and Suitability of Woods for Woodworking

DONALD G. COLEMAN*

(Continued from December, 1940, Industrial Arts and Vocational Education)

Warping

Warping, as shown in Figure 3, is responsible for much waste in fabricating and for some unsatisfactory service. It is defined as: "Any variation from a true or plane surface. Warp includes bow, crook, cup, and twist." The warping of wood is closely allied with shrinkage. Lumber that is cross-grained, or is from near the central core of the tree, tends to warp when it shrinks. Warping can be reduced to a minimum by the use of quarter-sawed dry material. The combined characteristics of warping and shrinkage determine the ability of wood to stay in place. Ability to stay in place, that is, remain flat, straight, and not change size, is desired in practically all uses. It is especially important in furniture and cabinetwork. All woods require proper seasoning in order to stay in place well.

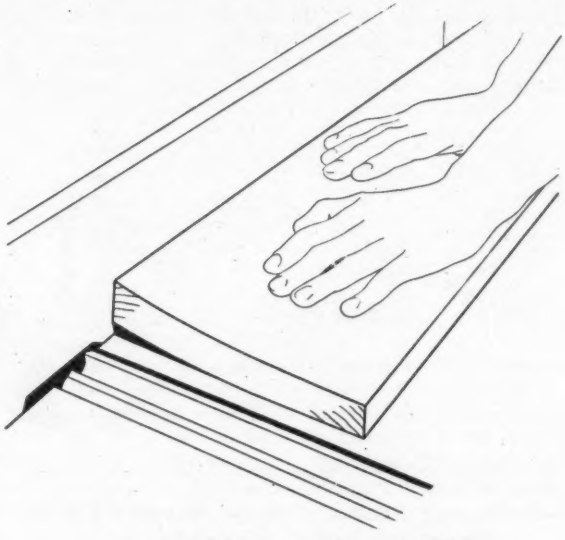


Fig. 3. Planing a piece of warped lumber

The tendency of different woods to warp and twist during seasoning and incident to changes in atmospheric conditions once the wood is dry is shown in the foregoing list.

Table of Comparative Freedom from Warping

High	*Intermediate*	*Low*
Cedar, eastern red	Ash, white	Beech
Cedar, northern white	Ash, black	Cottonwood
Cedar, southern white	Basswod	Elm, soft
Cedar, western red	Birch, yellow	Gum, red
Cherry	Cypress, southern	Sycamore
Chestnut	Douglas fir	Tupelo
Pine, northern white	Elm, rock	
Pine, ponderosa	Fir, balsam	
Pine, sugar	Fir, white	
Pine, western white	Hackberry	
Poplar, yellow	Hemlock, eastern	
Redwood	Hemlock, western	
Spruce, eastern	Hickory, pecan	
Spruce, Engelmann	Hickory, true	
Spruce, Sitka	Larch, western	
Walnut	Locust, black	
	Locust, honey	
	Maple, hard	
	Maple, soft	
	Oak, red	
	Oak, white	
	Pine, southern yellow	

Ease of Working with Hand Tools

Wood in general is easy to cut, shape, and fasten with ordinary tools. See Figure 4. For some purposes the difference between

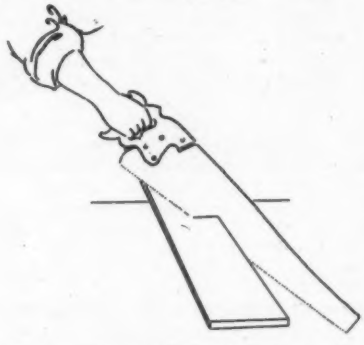


Fig. 4. The resistance of wood to being shaped with hand tools

Table Showing Comparative Ease of Working with Hand Tools

High	*Intermediate*	*Low*
Basswood	Cedar, eastern red	Ash, black
Cedar, northern white	Chestnut	Ash, white
Cedar, southern white	Cottonwood	Beech
Cedar, western red	Cypress, southern	Birch, yellow
Pine, northern white	Fir, balsam	Cherry
Pine, ponderosa	Fir, white	Douglas fir
Pine, sugar	Gum, red	Elm, rock
Pine, western white	Hemlock, eastern	Elm, soft
Poplar, yellow	Hemlock, western	Hackberry
	Redwood	Hickory, pecan
	Spruce, eastern	Hickory, true
	Spruce, Engelmann	Larch, western
	Spruce, Sitka	Locust, black
	Walnut	Locust, honey
		Maple, hard
		Maple, soft
		Oak, red
		Oak, white
		Pine, southern yellow
		Sycamore
		Tupelo

*Senior Technical Editor, Forest Products Laboratory (Maintained in cooperation with the University of Wisconsin), Forest Service, U. S. Department of Agriculture, Madison, Wis.

woods in ease of working is negligible, but for others the smoothness and facility with which it can be worked have a decided influence on the quality of the finished job. In general, along with the tendency toward splitting in nailing, warping, and twisting, and the weight in handling, ease of working is of first importance to the worker. The load-carrying capacity and wear resistance of the harder and denser woods should not be sacrificed unduly for the ease of working of the softer woods, but a reasonable balance must be drawn in selecting wood for a specific use. A skilled carpenter working with lumber that is well seasoned and manufactured can get good results from even the more refractory woods, whereas an unskilled worker stands the best chance of getting good results from the easier working woods. The condition of the cutting edges of tools is of first importance because unsuitable or dull tools may lose for any species of wood the advantage it may have because of its ease of working.

Classification of the more common woods according to their working qualities is shown in the foregoing list. The classification is based on a combination of the hardness, texture, and character of the surfaces obtainable. Woods in the high class have soft, uniform texture and finish to a smooth surface, woods in the low class are hard or nonuniform in texture or less easy than high or intermediate woods to surface without chipping the grain, fuzzing, or grain raising. The intermediate class is between the groups described.

Planing (Hardwoods)

Much greater care is required with some woods than with others to obtain smooth surfaces with a planer. See Figure 5. These differences can be largely eliminated by proper control of speed, moisture content, and cutting angle. High cutterhead speeds

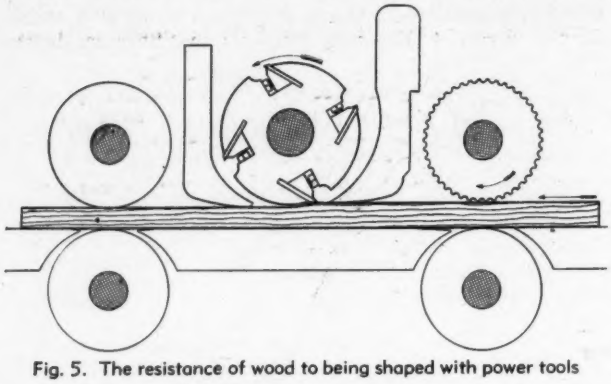


Fig. 5. The resistance of wood to being shaped with power tools

Table Showing Comparative Ease of Planing (Hardwoods)

Least difficult	*Intermediate*	*Most difficult*
Beech	Ash	Birch (sweet)
Gum, red and sap	Basswood	Cottonwood
Hackberry	Buckeye	Elm, soft
Magnolia	Chestnut	Hickory
Oak, chestnut	Gum, black	Maple, hard
Oak, red	Gum, tupelo	Maple, soft
Oak, white	Pecan	Sycamore
Poplar, yellow		Willow

(5400 r.p.m. and 54 ft. feed per minute) give better results than low speeds (3600 r.p.m. and 36 ft. feed per minute). The foregoing classification is based on the chip marks, and chipped, raised, and fuzzy grain that developed in planing wood at 6, 12, and 20 per cent moisture content with a cabinet planer having knives set at a 30 deg. angle and operated at the two speeds just mentioned. Good planing qualities are desired in practically all uses to which wood is put by the home woodworker.

Shaping

Almost any wood makes a passable showing when shaped at a slight angle to the grain. See Figure 6. It is in shaping across the end grain that the big differences between species show up. Further experiment will no doubt reveal means of improving the

Table of Comparative Difficulty of Shaping (Hardwoods)

Least difficult	*Intermediate*	*Most difficult*
Birch (sweet)	Ash	Basswood
Hickory	Beech	Buckeye
Maple, hard	Chestnut	Cottonwood
Oak, chestnut	Elm, soft	Magnolia
Oak, red	Gum, black	Tupelo
Oak, white	Gum, red and sap	Willow
Pecan	Hackberry	
Sycamore	Maple, soft	
	Poplar, yellow	

results with the more difficult woods. Meanwhile preliminary tests group the woods as shown, smoothness of cut and absence of splintering or chipping being the governing considerations. The shaper used was of the standard two-knife type running at a typical commercial speed of 7200 r.p.m.

Turning (Hardwood)

Some of the woods, like beech and pecan, turn relatively well regardless of moisture content. See Figure 7. Other woods, like

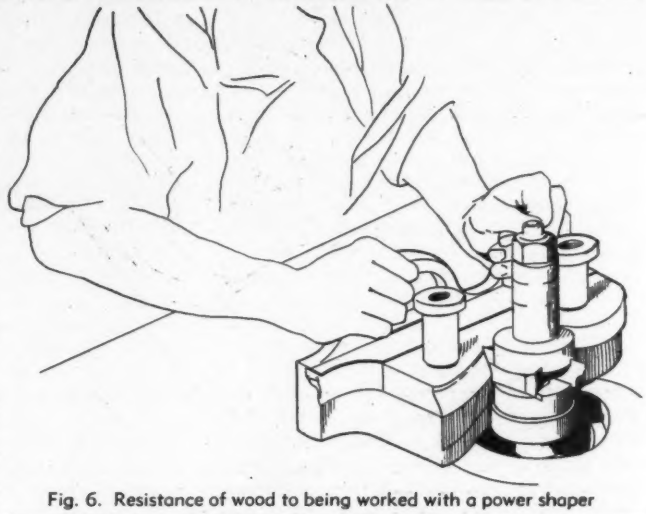


Fig. 6. Resistance of wood to being worked with a power shaper

Table Showing Relative Yield of "Smooth" Turnings

	Per cent		*Per cent*		*Per cent*
Beech	93	Oak, red	84	Maple, soft	78
Pecan	89	Oak, white	82	Gum, black	75
Gum, red and sap	86	Ash	81	Elm, soft	70
Hickory	86	Hackberry	79	Basswood	70
Sycamore	85	Magnolia	79	Cottonwood	70
Poplar, yellow	84	Tupelo	79	Willow	60

(Modified back knife lathe: 6, 12, 20 per cent moisture content.)

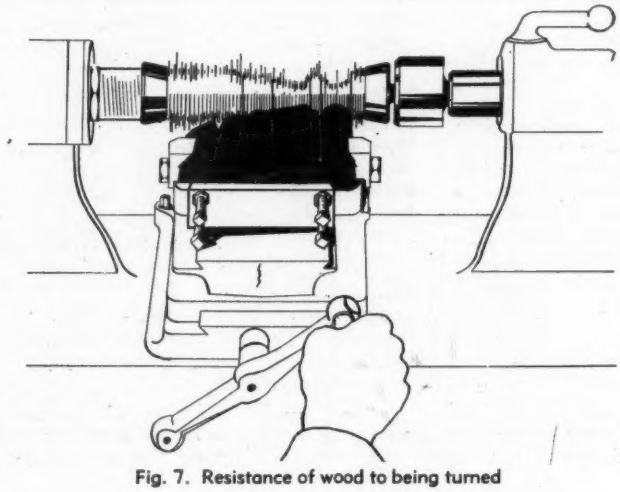


Fig. 7. Resistance of wood to being turned

cottonwood and willow, give good turnings only if dried down to about 6 per cent moisture content. In general, the heavier woods turn better than the lighter ones, and heavy pieces turn better than light pieces in the same wood. The main points considered in rating the foregoing woods as to quality of turnings were general smoothness, sharpness of detail, and occurrence of broken or chipped edges, as affecting the amount of sanding that must be done to make them acceptably smooth for use.

Bending Breakage (Hardwood)

Most hardwoods can be bent readily into a curved form. The comparatively low toughness of softwoods as a group makes them difficult to bend without excessive breakage. The following classification applies in bending hardwood squares three-fourths inch in size on a 20-in. radius without end pressure or any support on the outside of the bend, as shown in Figure 8, and without selection beyond excluding knotty, decayed, or checked pieces.

Table Showing Comparative Bending Breakage (Hardwoods)

	Per cent		*Per cent*		*Per cent*
Oak, white	9	Ash	36	Maple, hard	51
Oak, red	14	Beech	40	Tupelo	53
Oak, chestnut	18	Gum, red and sap	44	Gum, black	66
Magnolia	18	Maple, soft	47	Cottonwood	69
Birch, sweet	22	Chestnut	50	Sycamore	84
Elm, soft	28	Poplar, yellow	51	Basswood	95

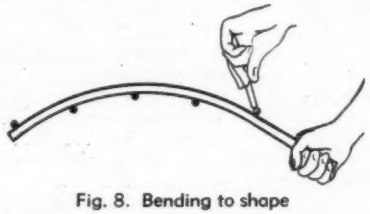


Fig. 8. Bending to shape

The amount of steaming and the manner in which pressure is applied are important factors in bending. However, insofar as the wood itself is concerned some kinds must be selected and handled more carefully than others. Bending breakage is an important consideration in selecting woods suitable for boat building, certain types of furniture, and other uses. The types of bending breakage are shown in Figure 9.

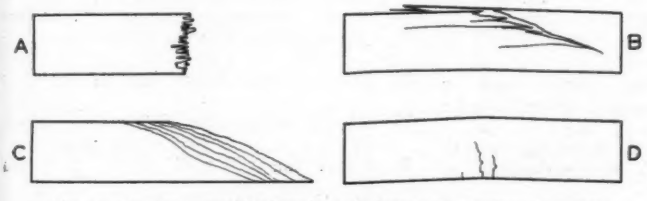


Fig. 9. Breaks caused by bending, A, brash; B, tension; C, cross grain; D, compression

Nail-Holding Power

As a rule, fastenings are the weakest link in all forms of construction and in all materials; therefore the resistance which is offered by the wood itself to the withdrawal of nails is important. See Figure 10. Usually, the denser and harder the wood the greater is the inherent nail-holding power. The foregoing classification, of the commercial woods according to their inherent nail-holding power, is based on tests that measured the number of pounds required to pull nails from wood.

The size, type, and number of nails have a marked effect on the strength of the joint. The resistance to withdrawal of nails increases almost directly with the diameter; that is, if the diameter of the nail is doubled, the holding power is doubled, providing the nail does not split the wood when it is driven. The lateral resistance of nails increases as the 1½ power of the diameter. Of the three nails most commonly used, plain, cement coated, and barbed, the cement-coated nail has, in well-seasoned wood, the highest holding power, and the barbed nail the lowest. New or specialized types of nails are introduced on the market from time to time, some of them giving substantially improved results.

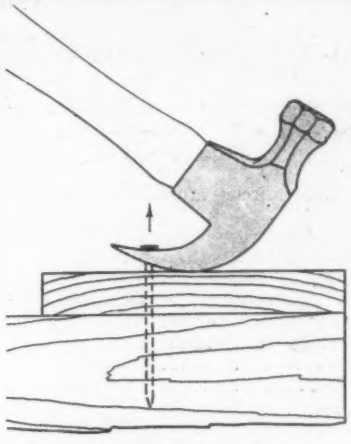


Fig. 10. Nail-holding power

One of these new nails is minutely pitted or etched in such a way as to increase the holding power even more than does the cement-coating just mentioned.

The moisture content of the wood at the time of nailing is extremely important for good nail holding. If nails are driven into wet wood they will lose about three-fourths of their full holding power when the wood becomes dry. So large is this loss that siding, barn boards, or fence pickets are very likely to become loose when nails are driven into green wood even when the best of nails and nail-holding woods are used. Barbed nails are better adapted for use with wet or poorly dried wood than either plain or cement-coated nails when for some unavoidable reason wood in such a condition must be used. The first and most important rule in obtaining good joints and high nail-holding power is to use well-seasoned wood.

Table Showing the Comparative Nail-Holding Power of Woods

High	*Intermediate*	*Low*
Ash, white	Chestnut	Basswood
Beech	Cypress, southern	Cedar, northern white
Birch, yellow	Douglas fir	Cedar, western red
Elm, soft	Gum, red	Cottonwood
Hickory, true	Hemlock, eastern	Fir, white
Larch, western	Hemlock, western	Spruce, Engelmann
Locust, black	Pine, northern white	
Locust, honey	Pine, ponderosa	
Maple, hard	Pine, western white	
Maple, soft	Poplar, yellow	
Oak, red	Redwood	
Oak, white	Spruce, eastern	
Pine, southern yellow		
Sycamore		
Tupelo		

Table Showing Comparative Splitting Tendencies in Nailing (Hardwoods)

Splits by less than 25 per cent of nails	*Splits by 25 to 40 per cent of nails*	*Splits by over 40 per cent of nails*
Buckeye	Ash	Beech
Cottonwood	Basswood	Birch, sweet
Elm, soft	Chestnut	Hackberry
Poplar, yellow	Gum, black	Hickory
Sycamore	Gum, red and sap	Maple, hard
Willow	Magnolia	Maple, soft
	Oak, red	Oak, chestnut
	Oak, white	Pecan
	Tupelo	

(To be continued)

Testing and Tests

INDUSTRIAL-ARTS AERONAUTICS TEST

M. D. Caffin,
Scotch Plains, N. J.

Part I

Directions: Place circle around correct answer.

1. In July, 1938, there were about 100,000 pilots of all classifications and about 50,000 airplanes with certification..... Yes No
2. Approximately 12,000 persons are employed by the commercial airlines ..... Yes No
3. A dirigible is an aerostat..... Yes No
4. Airplanes may generally be classified as land and seaplanes Yes No
5. An ornithopter is similar to an autogiro but has power-driven rotating vanes which give it lift. Yes No
6. An autogiro obtains its lift from its forward motion which rotates the vanes or lifting surfaces ..... Yes No
7. The minimum age for a student's solo, or private license is 18 years..... Yes No
8. Twenty-five solo hours per year are required for renewal of the solo license ..... Yes No
9. A riveted dural fuselage is as rigid as a welded steel structure Yes No
10. Can dural be welded?..... Yes No
11. For most wings C/P travel is between 25 and 50 per cent of the chord..... Yes No
12. Resistance and lift vary directly with wing area..... Yes No
13. A plane traveling 200 m.p.h. has twice the resistance it would have if it were traveling 100 m.p.h. ..... Yes No
14. When an airplane stalls, its engine comes to a standstill... Yes No
15. Douglas Fir is widely used in construction of wooden airplane wings ..... Yes No
16. Skeleton ribs give a wing its shape or contour..... Yes No
17. Ribs are generally placed about 6 in. apart on a wing..... Yes No
18. Plywood-covered wings keep their contour better than fabric-covered wings..... Yes No
19. An extruded spar is a solid type of metal spar..... Yes No
20. An internally braced monoplane wing is known as a semicantilever type..... Yes No
21. Full cantilever wings are generally tapered in thickness and planform as the tip is approached, while biplane wings usually have a constant thickness ..... Yes No
22. Dural spars are always of extruded type ..... Yes No
23. The empennage consists of the tail surfaces such as the fin, rudder, elevator, and stabilizer Yes No
24. Pushing the stick forward will raise the nose of the plane.... Yes No
25. The torque-tube system of aileron control is popular for light training ships either monoplane or biplane..... Yes No
26. A monocoque fuselage would require a smaller fin area than a rectangular fuselage.... Yes No
27. Most designers use metal in the structure of control surfaces.. Yes No
28. Full cantilever type retractable landing gear usually have bracing wires running to the fuselage Yes No
29. Tricycle landing gear usually consists of two wheels at the forward part of the fuselage with one wheel supporting the tail ..... Yes No
30. The shape of the propeller blade is a series of small airfoils diminishing in thickness as the tip is approached..... Yes No
31. Walnut, cherry, mahogany, and oak are used when a wood propeller is to be run at speeds greater than 1700 r.p.m. ..... Yes No
32. A coat of aluminum varnish is applied to a new wood propeller so that it can then be painted any desired color ..... Yes No
33. Propeller etching is a process used on propellers which leaves a design or manufacturer's insignia on the propeller..... Yes No

Key for Part I

1. no	12. yes	23. yes
2. yes	13. no	24. no
3. yes	14. no	25. yes
4. yes	15. no	26. no
5. no	16. yes	27. yes
6. yes	17. no	28. no
7. no	18. yes	29. no
8. no	19. yes	30. yes
9. no	20. no	31. no
10. no	21. yes	32. no
11. yes	22. no	33. no

Part II

Directions: Write the correct word or words in each blank space in order to make a correct statement.

1. The event which was responsible for the greatest impetus to the development of aviation was .....
2. The Montgolfier brothers were the first to .....
3. Samuel Langley is to be remembered for his experiments and investigations with .....
4. Requirements for an air-line pilot's license are:
   Age .....
   Citizenship .....
   Education .....
   Flying experience.....
   Renewal .....
   Aeronautical knowledge.....
   Physical condition.....
5. Warping a wing helps to give it ..... balance.
6. The velocity of the air flowing around the upper camber of a wing is ..... than the velocity of air flowing around the lower camber, and thus the plane obtains lift.
7. Wings with thicker sections have a .... lift value but also have .... air resistance.
8. The resistence between any two adjacent members (vertical) on a fuselage is known as a .....
9. ..... is used as a covering of modern steel tube fuselages.
10. Four advantages of monocoque fuselage construction are:
    1. ..... 2. .....
    3. ..... 4. .....
11. Four types of fuselage construction are:
    1. ..... 2. .....
    3. ..... 4. .....
12. Three different types of skeleton rib trusses are:
    .....
    .....
    .....
13. Five parts of a wing are:
    .....
    .....
    .....
    .....
    .....
14. The function of the flanges on an I beam spar are to take ..... and .... respectively.
15. Wood ribs for thick section wings are usually of the ..... type.
16. Joints in a rib truss are reinforced with .....
17. Three disadvantages of plywood covering on a wing are:
    .....
    .....
    .....
18. In a biplane the wires located between the wings and leading from the fuselage diagonally upward toward the edge of the upper wing are known as .....
19. A full cantilever wing is thicker than a semicantilever type because .....
20. In the conventional design of airplane the control surfaces are located .... and .....
21. The elevator is hinged back of the ....
22. A barrel roll is a complete rotation about the ..... axis of the plane.
23. A stall causes loss of ..... and lift.
24. The parts making up the tail group are:
    1. ..... 2. .....
    3. ..... 4. .....
25. Most retractable landing gear retract... ..... (in which direction).
26. Some shock-absorbing devices used in landing gear are:
    1. ..... 2. .....
    3. ..... 4. .....
27. Four advantages of a metal propeller over wood are:
    1. ..... 2. .....
    3. ..... 4. .....
28. Two devices used in the manufacture of wood propellers to make them stronger and more durable are:
    1. ..... 2. .....

Key for Part II

1. World War.
2. Fly a balloon successfully.

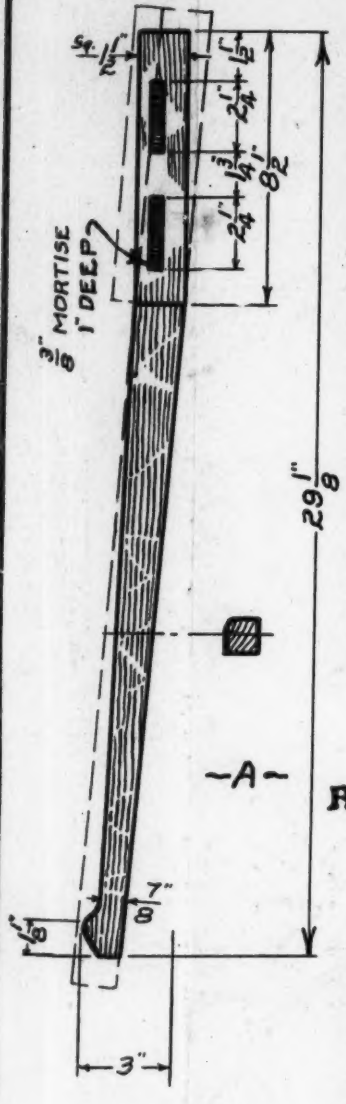
(Continued on page 25)

TELEPHONE STAND

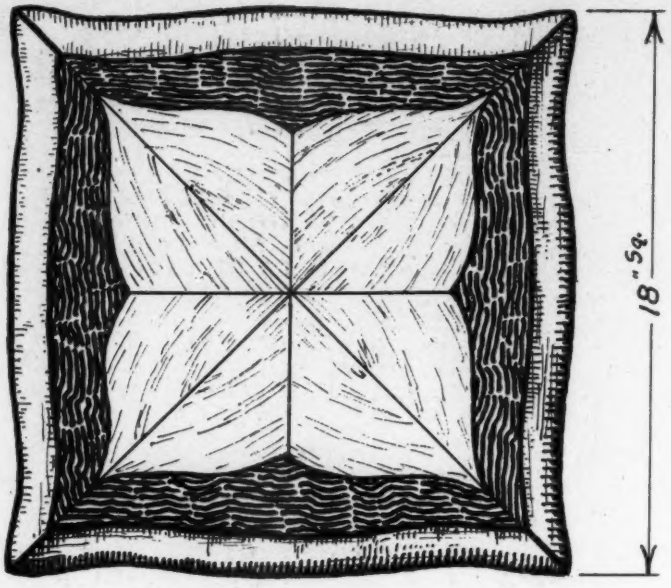
Scale $\frac{3}{16}$" = 1"

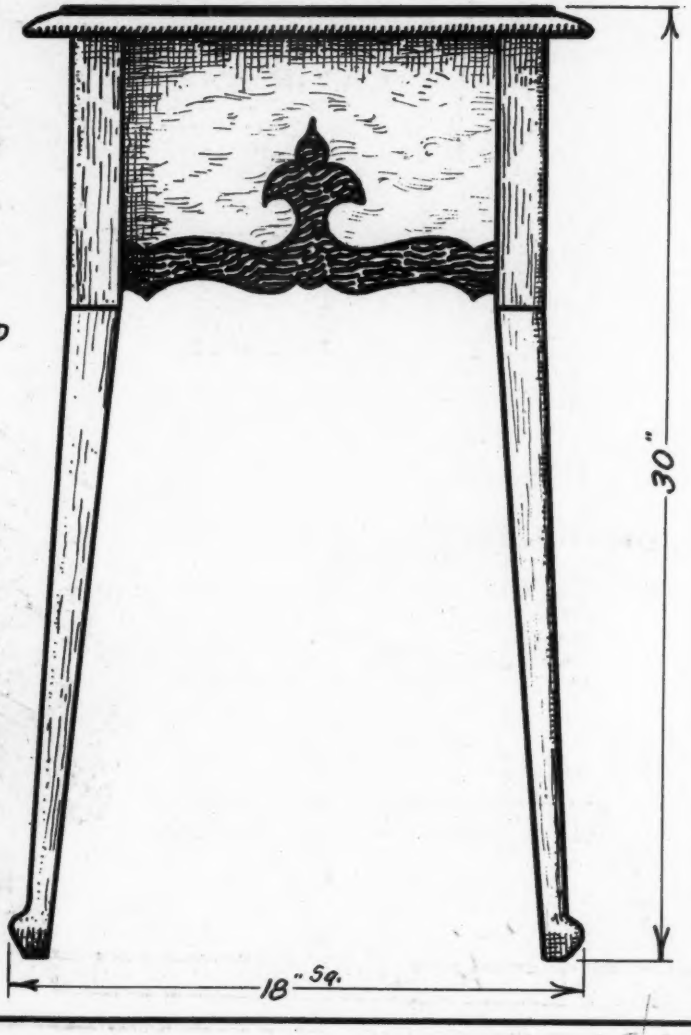
NOTE – THIS STAND IS DESIGNED TO HOLD THE CRADLE PHONE SECURELY, AS YOU DIAL THE NUMBER. IT ALSO KEEPS THE UNSIGHTLY TELEPHONE BOOK AS WELL AS THE PHONE ITSELF OUT OF VIEW.

LEGS – THESE ARE MADE FROM FOUR PIECES OF $1\frac{3}{4}$" SQUARE STOCK ABOUT 31" LONG. JOINT A FACE SIDE AND A FACE EDGE AND THEN RIP TO $1\frac{5}{8}$" SQUARE. ON TWO ADJACENT SIDES GLUE PIECES OF $\frac{3}{4}$" STOCK 9" LONG. THESE ARE PLACED AT ONE END. WHEN DRY DRESS THEIR EDGES FLUSH TO SQUARE STOCK. OBTAIN THE LAYOUT SHOWN AT -A- ON TWO ADJACENT SIDES OF EACH LEG AND THEN BANDSAW. DRESS WOOD TO A SMOOTH AND TRUE SURFACE WITH A PLANE AND FILE. BORE THE MORTICES ONE INCH DEEP. WITH A SPOKESHAVE FORM A $\frac{1}{4}$" ROUND ON OUTSIDE CORNER. SAND LEGS.



RAILS – CUT FOUR pcs. $\frac{3}{4}$" X $8\frac{1}{4}$" X $14\frac{1}{4}$" IN THE ROUGH FOR THE RAILS. IT IS INTENDED THAT THE TOP AND SIDES BE VENEERED. MAPLE AND WALNUT MAKE A GOOD COMBINATION. IF VENEER IS USED IT SHOULD BE APPLIED BEFORE THE RAILS ARE SQUARED UP.





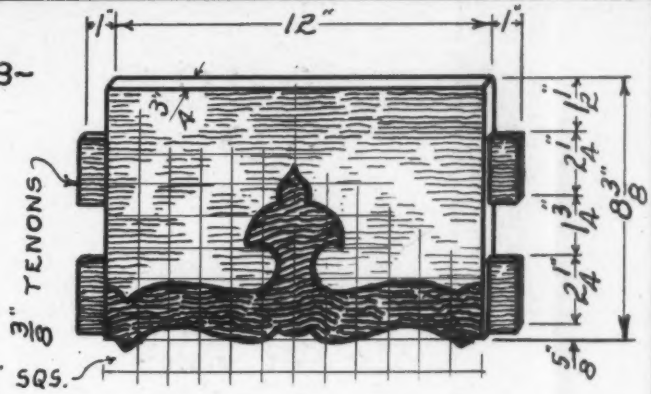
Submitted by Clifford B. Smith, Buffalo, N. Y.

IF SEVERAL STANDS ARE BEING MADE, IT MAY BE WELL TO BAND-SAW SEVERAL LAYERS OF BOTH KINDS OF VENEER AT A TIME. PLACED AS A SANDWICH BETWEEN TWO LAYERS OF BASSWOOD THE VENEER WILL CUT CLEAN.

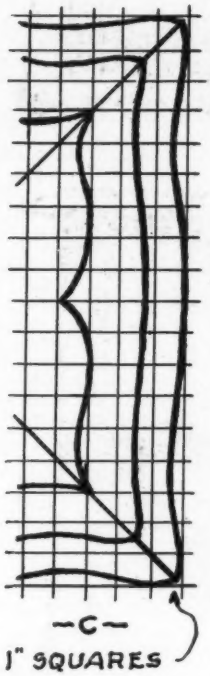
CROSS-BAND THE VENEER BY PLACING A CHEAPER GRADE UNDERNEATH WITH THE GRAIN RUNNING CROSS-WISE. THE DESIGN COMPOSED OF DIFFERENT PIECES OF VENEER IS HELD TOGETHER WITH STRIPS OF ADHESIVE PAPER. GLUE.

IF VENEER IS NOT USED THE DESIGN MAY BE VEINED IN.

-B-



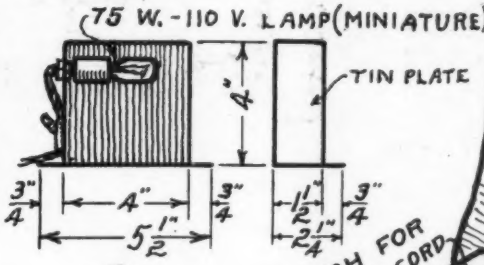
JOINT ONE EDGE (TOP) AND THEN SQUARE UP TO 14" IN LENGTH. CUT THE TENONS TO FIT THE MORTICES.



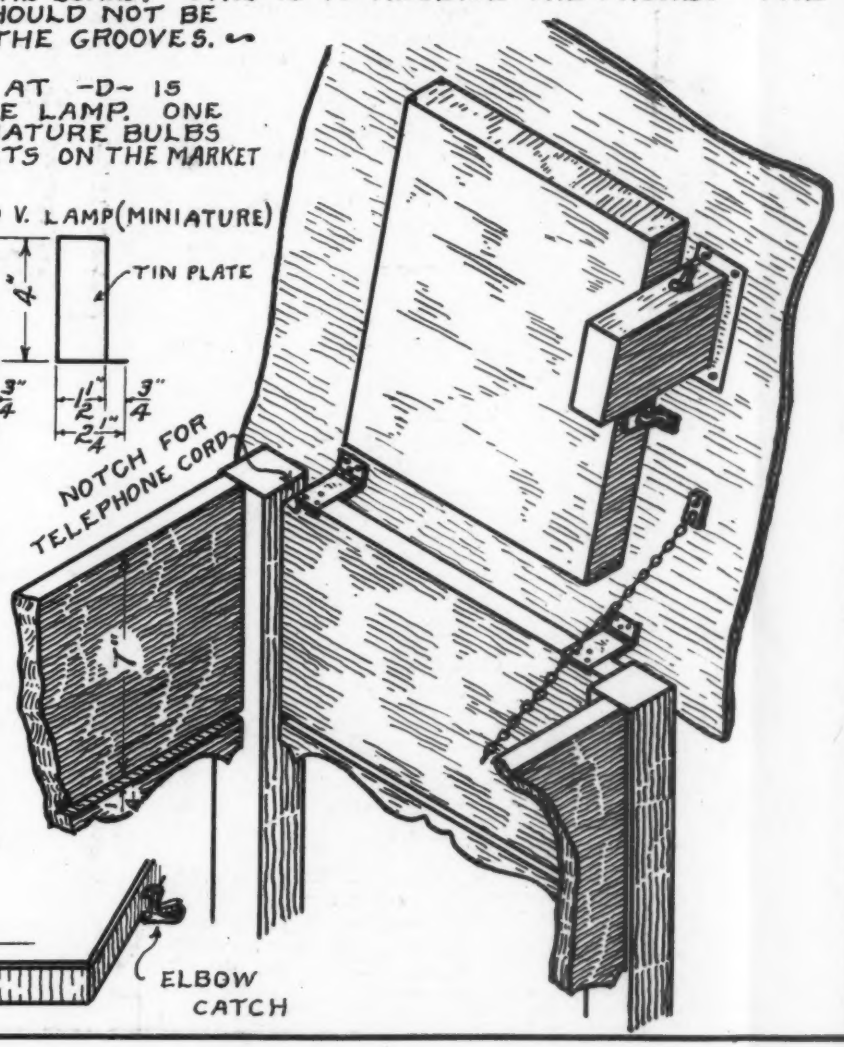
TOP - CUT THE TOP 18 1/2" SQUARE IN THE ROUGH. VENEER THE SAME AS THE RAILS. TOP SHOULD BE FASTENED TO THE STAND WITH TABLE HINGES.

BOTTOM - THE BOTTOM IS 1/2" X 16 3/4" X 16 3/4" WHEN FINISHED. A 1/4" TONGUE IS MADE ON ITS FOUR EDGES. THE SHOULDERS ARE 16 1/4" SQUARE. RECESS 1/8" DEEP AN ELIPTICAL SPACE 5 1/2" X 6 1/4" CENTRAL ON THE BOARD. THIS IS TO RECEIVE THE PHONE. THE BOTTOM SHOULD NOT BE GLUED IN THE GROOVES.

LAMP - AT -D- IS SHOWN THE LAMP. ONE OF THE MINIATURE BULBS AND SOCKETS ON THE MARKET IS USED.

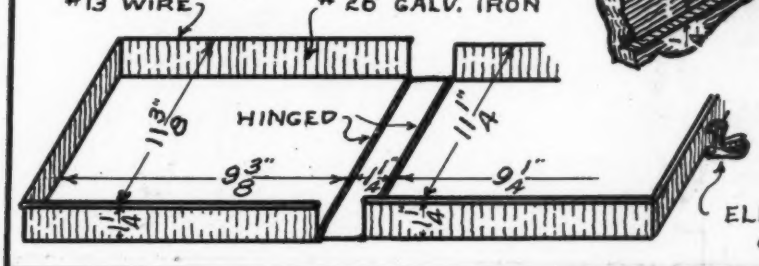


-D-



BOOK CONTAINER - THIS IS MADE OF GALV. IRON TO FIT YOUR TELEPHONE BOOK. THE RIGHT HAND LEAF SHOULD BE FASTENED TO THE TOP WITH 1/2" - #4 FT. HD. SCREWS.

-E-



Submitted by Clifford B. Smith, Buffalo, N. Y.

(Continued from page 20)

3. Airfoils and their relation to wind resistance.
4. Age 23, Citizen U. S., High school graduate or equivalent, 1200 hours solo last 8 years including night and cross-country flight, renewal 10 hours airline flight during past year, 5 by instruments, physical condition perfect, knowledge airline regulations, radio, forecasting, navigation, traffic rules, Civil Aeronautic regulations airplanes and engines.
5. Lateral.
6. Greater.
7. Higher, more.
8. Bay.
9. Fabric.
10. Better stream lining, unobstructed interior, more baggage space, less maintenance, more reliable in violent manoeuvers.
11. Welded steel tube, dural tube, dural monocoque, wood monocoque, stainless-steel monocoque.
12. Pratt truss, Warren truss, Howe truss.
13. Skeleton ribs, spars, leading edge, trailing edge, bracing wires, root ribs or webbed ribs, fabric.
14. Compression and tension.
15. Truss.
16. Gussets.
17. Difficult to inspect, costly to repair, heavier than fabric.
18. Flying wires (prevent wings from folding over in flight).
19. Internal bracing necessary to properly support wing.
20. Rear of fuselage and wings.
21. Stabilizer.
22. Longitudinal.
23. Control or flying speed.
24. Stabilizer, elevator, fin, rudder.
25. Inward or backward.
26. Hydraulic, coil springs, air wheels, cord rubber.
27. Stronger, more efficient due to thinner airfoil section, not affected as much by climatic conditions, withstands rain, sleet gravel better, can be repaired.
28. Making propellers of laminations of wood, using metal tips on leading and trailing edges, kiln drying of wood, use of protective coating of aluminum varnish.

Part III

Directions: Find the statement in the right-hand column that most nearly matches one in the left-hand column, and write its letter in the parentheses.

1. ( ) Chanute
2. ( ) Civil Aeronautics
3. ( ) Juan De La Cierva
4. ( ) Federal Aeronautics
5. ( ) 15 hours per year
6. ( ) 5 hours flight, 3 in last 60 days
7. ( ) longeron
8. ( ) stalling angle
9. ( ) angle of attack
10. ( ) Center of pressure
11. ( ) Aspect ratio
12. ( ) Nacelle
13. ( ) Truss type
14. ( ) Centrifugal force acting
15. ( ) Fin
16. ( ) Aileron
17. ( ) Stabilizer
18. ( ) Empennage
19. ( ) Centripetal force acting

A. Renewal of private pilot's license
B. Required experience for solo license
C. Gliders
D. Manufacturing of aircraft
E. Autogiro
F. Weather Service
G. Rectangular fuselage
H. Position of airfoil relative to wind
I. Body member usually found in wing
J. Relation of span to chord
K. Main member truss-type fuselage
L. Burble point
M. Lift drag ratio
N. Monocoque
O. Stainless steel fuselage
P. Tail assembly
Q. Control surface
R. Horizontal balance
S. Aids straight flight
T. Sideslip
U. Skid
V. Loop
W. 360-deg. turn

Key for Part III

1. c	8. l	15. s
2. d	9. h	16. q
3. e	10. m	17. r
4. f	11. j	18. p
5. a	12. i	19. t
6. b	13. g	
7. k	14. u	

Part IV

Directions: Write the letter of the correct answer in the parentheses.

1. A loop is a complete turn of the airplane on its ( ) axis.
   (A) longitudinal (B) lateral (C) vertical
2. A 360-deg. turn is made on the ( ) axis.
   (A) longitudinal (B) lateral (C) vertical
3. A trim tab is a ( ).
   (A) Wing flap (B) small movable part of the trailing edge of any of the movable controls (C) device used to trim off the interior of a plane (D) another type of aileron
4. Three woods used in propellers are ( ) ( ) ( ).
   (A) Spruce (B) Pine (C) Birch (D) Walnut (E) Maple (F) Teak (G) Ash (H) Hickory (I) Gum (J) Oak
5. Early metal propellers were: (A) twisted and shaped, (B) forged out of one piece, (C) made out of two pieces. ( ).
6. The differences between controllable pitch and detachable blade propellers is (A) none, (B) both can be adjusted, (C) the blades will come off one but not the other, (D) one is hollow, (E) blade pitch on first can be adjusted in flight, the second cannot.

Key for Part IV

1. B	4. C. D. J
2. C	5. A
3. B	6. E

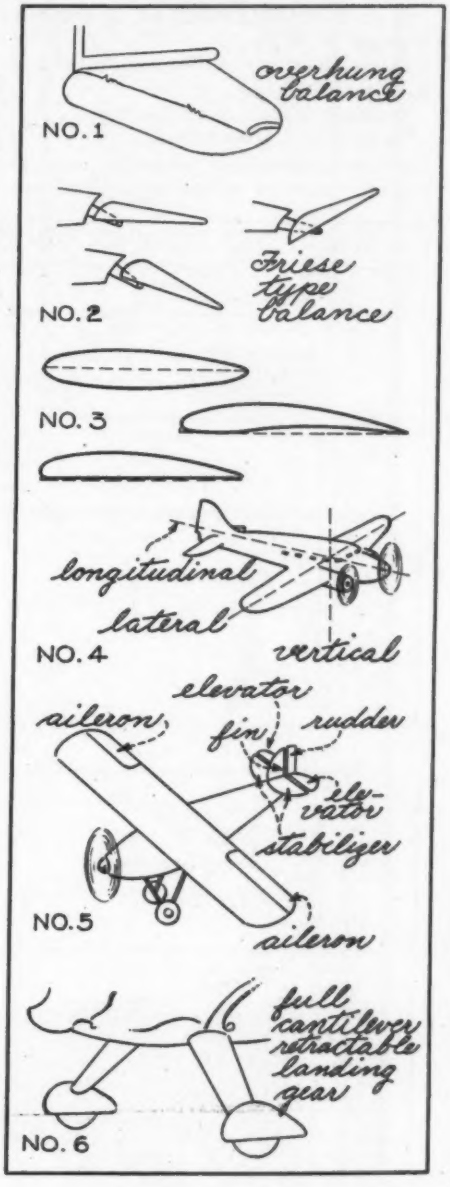
Part V

Directions: Refer to the sketches on page 7 and answer the following questions.

1. Sketch 1 and 2 illustrate different principles of construction used on the elevator-stabilizer assembly. Number 1 illustrates ....., number 2 illustrates .....
2. Sketch 3 shows three different types of airfoils. Draw in the chord line on each of these.
3. Sketch 4 illustrates a plane in flight. On the sketch indicate the three axes and label each.
4. Label all the control surfaces in sketch number 5.
5. What type of landing gear construction is illustrated in sketch number 6.

Key for Part V

Answers indicated on the following sketches.



Answers to the questions in Part V are shown in writing, dotted lines, and center lines

♦ The Warren, Pa., public schools with the cooperation and under the supervision of Pennsylvania State College has set up, on an experimental basis, courses under the Directed Correspondence Study Plan.

The number of pupils who may take these courses has been limited to 50 in this experimental study. The purpose has been to enlarge the offerings to members of the junior and senior years in the high school. Among the elections made by these pupils are the following: radio, Diesel engines, gasoline engines; automobiles, home-economics foods; home-economics clothing construction; courtesy in modern living; consumer education; operation of a small retail business; general agriculture; and advanced algebra.

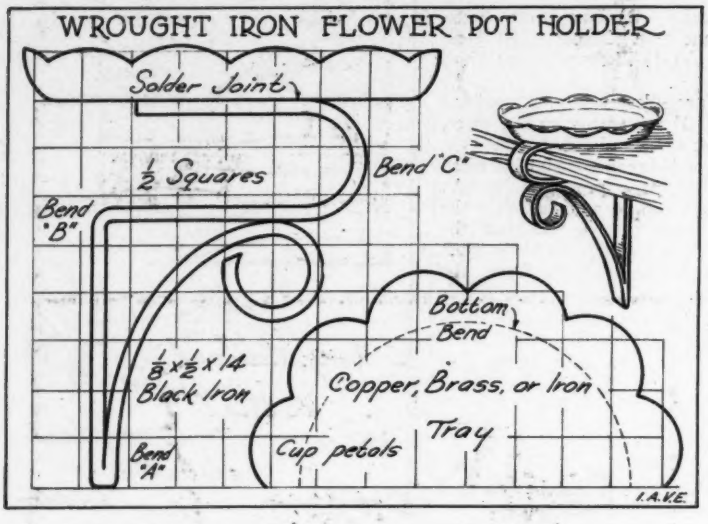
Problems and Projects

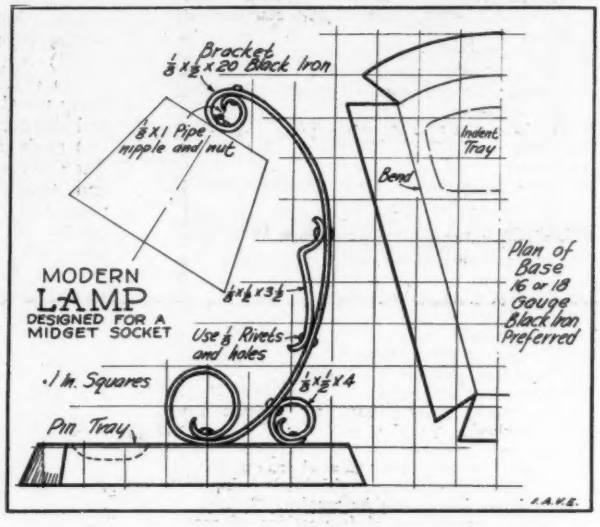
FOUR SIMPLE PROJECTS FOR THE METAL WORKER

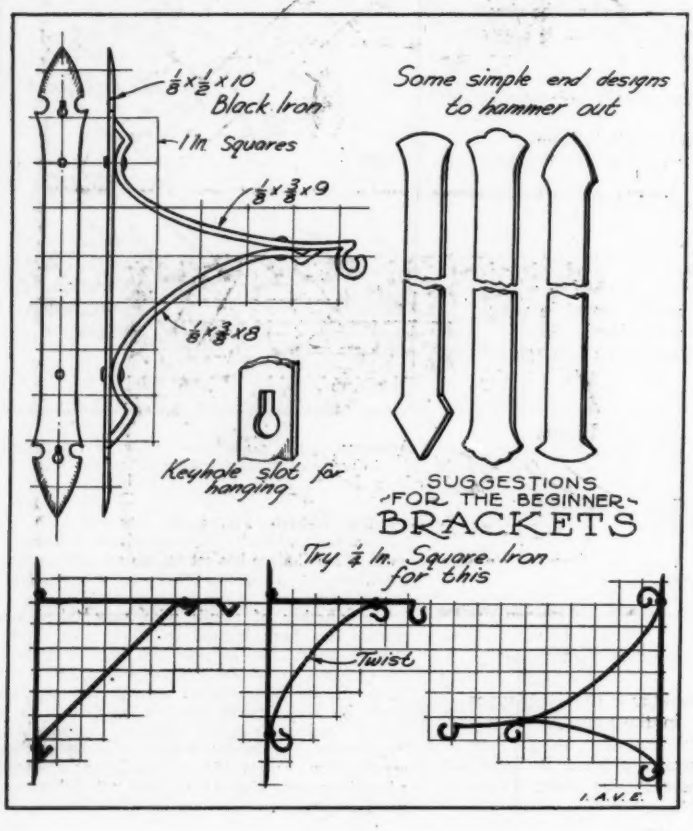
William W. Wills,
South High School, Denver, Colo., and
Delmar W. Olson,
Southern Illinois State Normal University, Carbondale, Ill.

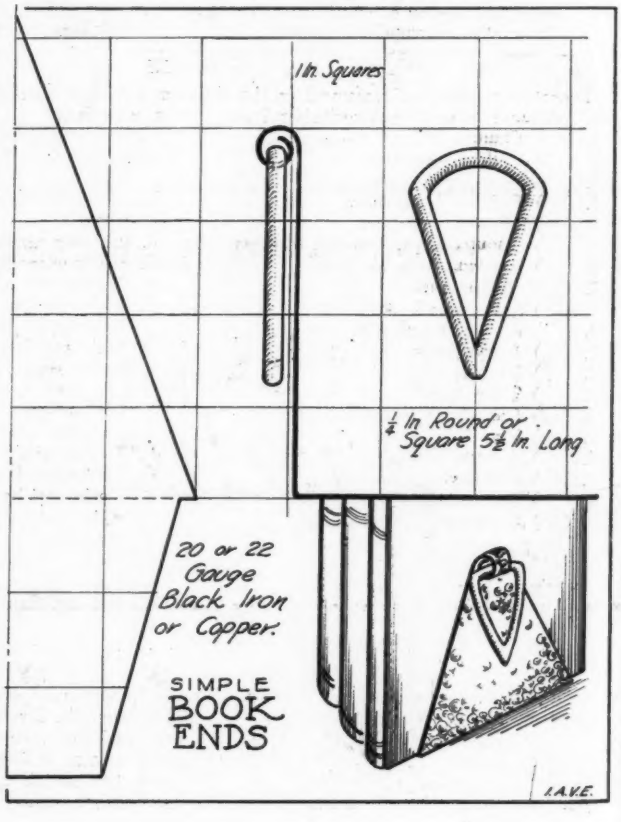
Amateur metalworkers invariably wish to produce articles of artistic worth. Yet their training and ability rarely permits them to rely on their own sense of design in planning projects.

The designs submitted herewith were prepared with the idea of helping such workers. The projects presented are of varying degrees of difficulty. None of them will necessitate elaborate or expensive equipment, and most of them will require no more than elementary skill.




⅛ x ½ x 20 Black Iron Bracket
⅜ x 1 Pipe nipple and nut
Indent Tray
Bend
MODERN LAMP DESIGNED FOR A MIDGET SOCKET
⅛ x ½ x 3½
Use ⅛ Rivets and holes
Plan of Base 16 or 18 Gauge Black Iron Preferred
.1 In. Squares
⅛ x ½ x 4
Pin Tray
I.A.V.E.


⅛ x ½ x 10 Black Iron
1 In. Squares
⅛ x ⅜ x 9
⅛ x ⅜ x 8
Keyhole slot for hanging
Some simple end designs to hammer out
SUGGESTIONS FOR THE BEGINNER
BRACKETS
Try ¼ In. Square Iron for this
Twist
I. A. V. E.



A CHRISTMAS CARD PROJECT

Raymond M. Alexander,
Armstrong High School, Washington, D.C.

The *Christmas Post Office* is an annual project at the Armstrong High School. Much interest is manifested by the students in the undertaking, because they genuinely enjoy it.

The *Post Office* is a booth set up in the

Suggested Christmas greetings

school cafeteria, completely staffed by student personnel. Emulating our great American mail system, the postmaster, sales clerks, bookkeepers, and carriers, all cheerfully perform their duties with efficiency and dispatch.

Cards may be purchased ranging in price from one cent to five cents each. Delivery is free within the school building. A special *outside* mailbox is provided to handle cards going through the regular U. S. mails.

For the past two seasons the students in the sign-painting classes have made the designs for the cards. Posters are made in the usual way on 24 by 18-in. white cardboard. Black poster color or black drawing ink is employed exclusively for the reason that the cards are printed by the offest method and must photograph clearly.

After the posters have been completed, the best ones are selected for reproduction. The offset printing is done by an outside firm. They are sent back to the school uncut, about 8 prints on a 11 by 14-in. card. The cards are then sent to the print shop where they are cut to size and the reverse sides are printed. Last year the principal, Dr. G. David Houston, composed the following appropriate verse which was printed on the cards:

CHRISTMAS GREETINGS

May Christmas bring you happiness,
Good health and hearty cheer,
Enough to last through Christmas week,
And usher in the year;
Then, as the year grows older,
Make "Peace, good will toward men"
Once more the world's best symbol
Till Christmas comes again!

Teachers of art classes will find this type of project highly stimulating to the students in their classes. Students get a real incentive out of having the results of their work reproduced in this manner and circulated among their classmates.

MAKING CHRISTMAS TREES SAFER

After having made tests with 5, 20, and 40 per cent solutions of 4 fire-retardant chemicals, on spruce and balsam Christmas trees, Arthur Van Kleeck, associate chemist of the Forest Products Laboratory at Madison, Wis., reports that keeping the tree standing in water is about the most satisfactory method of reducing the fire hazard, and of keeping the needles from discoloring or falling.

The chemicals used in the tests were ammonium sulfate, ammonium phosphate, ammonium sulfamate, and calcium chloride.

Mr. Van Kleeck's recommendations are: (1) Purchase a tree that has been cut recently and has not been allowed to dry out after being cut. (2) Cut off the end of the trunk diagonally at least one inch above the original cut. (3) Stand the tree at once in a container of water and always keep the water level above the cut surface. If the tree is bought several days before it is to be set up, keep it standing in water in a cool place.

If these suggestions are followed, the treatment will prevent the needles from drying out and thus becoming inflammable, and it also keeps the needles fresh and green and retards their falling off.

RACK FOR REFERENCE BOOKS AND PAMPHLETS

William K. Nevard
Sir Richard McBride Junior High School,
New Westminster, B.C., Canada

The display rack described herewith has proved to be very useful. The rack is designed to hold the numerous catalogs and industrial folders which, though valuable teaching aids, have always been difficult to house, and to display.

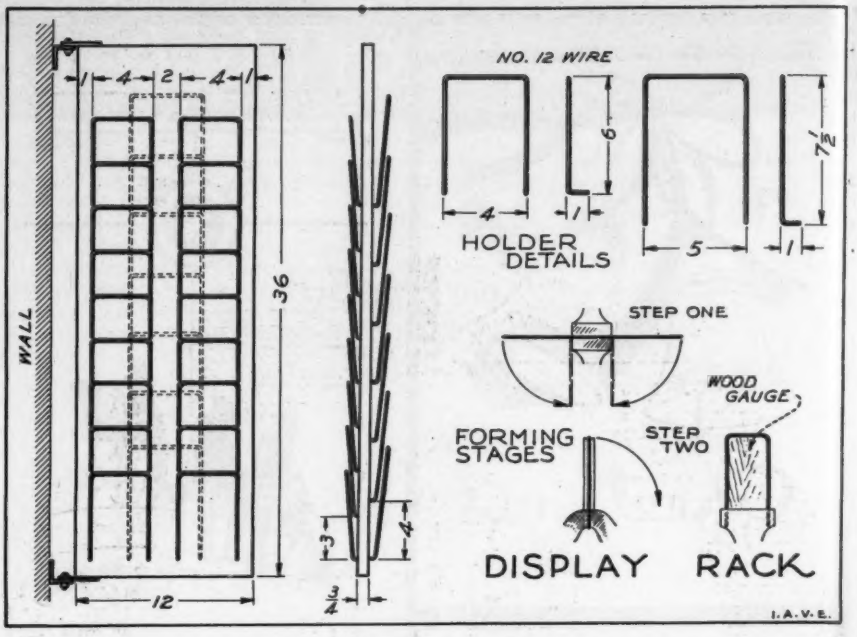
The features of this rack are:

1. It can be made by the students.
2. The titles of the books and pamphlets can be seen at a glance.
3. They are accessible.
4. The rack accommodates various sizes of folders and bulletins.
5. It is economical of space.
6. Additional panels may be added if required.
7. The rack is inexpensive and neat.

The panel is made of ¾-in. fir plywood and is pivoted from the wall by two brackets made of ⅛ by ¾-in. band iron. On one side of the panel there are two rows of wire holders to carry the smaller books and pamphlets, such as the Atkins Saw Manual, and on the other side a single row of larger holders will accommodate the bigger bulletins, such as the Behr-Manning Lecture Course.

To form the wire holder, first make sure that the pieces of No. 12 wire are all of the same length and straight. The smaller size can be formed in a 4-in. vise. Grip the wire centrally in the vise so that the projections at each side are equal. A stop clamped on the bench would eliminate constant measuring. Bend the wire ends to form the U shape, and stiffen the corners with mallet blows. Having formed all the wires to the U shape, square up a block of wood ¾ by 4 by 6 in. which is to be used as a gauge by slipping it inside the U and then inserting the 1-in. points of the wire in the vise for the next bend. Use a vise having 5-in. jaws for this operation.

Mark the positions for the holes and drill right through the panel for a driving fit for the wire. In assembling, start at the top of the panel and drive the 1-in. wire points in with a hammer. Place the panel on a metal surface in order to stop the wire flush on the back. After all holders are in place they can be adjusted by springing them out with the fingers.



ALUMINUM TRAYS

J. Ernest Kuehner,
Gundlach School,
St. Louis, Mo.

Aluminum may well be made a means of self-expression for the student, the instructor, and the homecraftsman.

Etched aluminum trays

Aluminum disks ranging from 4 to 22 in. in diameter, of 18 to 15 gauge metal are now available at very low prices. Used for serving trays, table dishes, center pieces, coasters, cocktail trays, or even decorative plaques, they present a challenge to good design and originality. Square and rectangular shapes also may be used if one desires to experiment with other than circular shapes. The metal may be etched with nitric or muriatic acids, or hammered, or subjected to both of these processes.

The process of designing and etching a tray and preparing it for use is rather simple. Boys and girls of the seventh- and eighth-grade level have been working with the metal in our shops and they have been most gratified with their results.

It will be noted, each disk has a very definite "grain" and that the surface has a very high gloss. This gloss should be removed from both sides with No. 3/0 steel wool, rubbing carefully with the grain. The rubbing should be continued until a dull sheen becomes apparent, and until all streaks and finger marks are removed. Finger marks in the process are less bothersome if the hands are washed often.

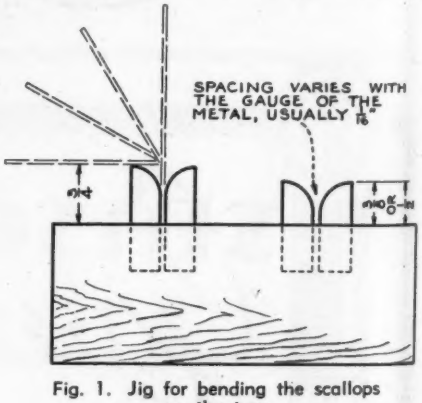


Fig. 1. Jig for bending the scallops on the tray

It will be assumed, of course, the design has been carefully planned for the area to be etched. Curved lines should be laid down with the compass or with a French curve. All

straight lines should be *straight*. Transfer the design to the disk by means of carbon paper, then with a soft cloth, rub the tray to remove any large particles of the carbon. This enables one to paint over the carbon lines without danger of the asphaltum creeping, assuring fine, clear-cut lines.

To lay out the scalloped edges of the tray, divide the outer circumference of the disk with a pair of dividers. This spacing may be made to suit the taste of the designer. On an 18-in. tray, 23 or 25 scallops make a very pleasing effect. Mark each point with a lead pencil, preparatory to *bending up* each scallop. The bending may be done with roundnose pliers around which adhesive tape has been wound. However, if great care is not exercised the pliers will mark the metal. The jig shown in Figure 1 serves much better. This jig is quickly and easily made by inserting two dowels in a piece of hardwood. The ends of the dowels should be rounded.

Design for a 12 or 15 in. tray. All black portions will stand out in relief. Scalloped edges are to be turned up. White lines should be trimmed smooth with a knife point before doing the etching

After the edge has been turned up, paint in the design with asphaltum paint. Usually the asphaltum has to be thinned a little with turpentine. Do not make it too thin or it will run when applied to the metal. About the consistency of good four-hour enamel seems to be quite satisfactory. Paint meticulously so that edges do not have to be trimmed. Only those parts that are to stand out in relief are to be blacked out. It is also well to cover the back in case any of the acid runs over the edges. Any trimming or *lining* should be done after the asphaltum has dried about two hours. By *lining* is meant the veining of leaves, separation of petals of flowers, or any distinction of motifs in the design.

Allow the asphaltum to dry about four or five hours — it is unwise to allow too much time to elapse before etching as the asphaltum may chip off. Because etching should be done before 24 to 30 hours have elapsed, designs should be simple if the work has to be done in the classroom. If the design cannot be completed during the period of class activity, the student should paint his design the night before and have it ready for etching during the class period.

The writer finds a solution of half muriatic acid and half water a very desirable combination for the etching process. *Always pour the acid into the water slowly* and allow the two to mix thoroughly before putting the solution on the metal. Under no condition pour water into the acid. It may be necessary to reduce this proportion, adding acid carefully as needed. Experimentation on scrap may save a good design for the beginner. The acid bought at different stores varies in strength. The time required to completely etch a tray may therefore vary from fifteen minutes to an hour. Understand, this etching should be a slow process; the process will cause the solution to boil vigorously and the metal will become quite hot during the process. I have a large glass container handy to pour off the solution if the metal becomes too hot, running cold water over the tray. Then pour the solution in the tray again if the etching is not sufficiently deep. The solution may be poured directly into the tray; this makes having containers, in which to place the tray, unnecessary. *Always wear heavy rubber gloves during the etching process. Muriatic acid will burn.*

When the etching process is complete the asphaltum may be removed with turpentine, gasoline, or benzine. Use a soft cloth so as not to scratch the metal. When all of the asphaltum has been removed, polish again with No. 3/0 steel wool. Never use any sort of metal cleaner, silver polish, or quick-cleaning substitutes. The newness may be brought out and finger marks removed with the steel wool.

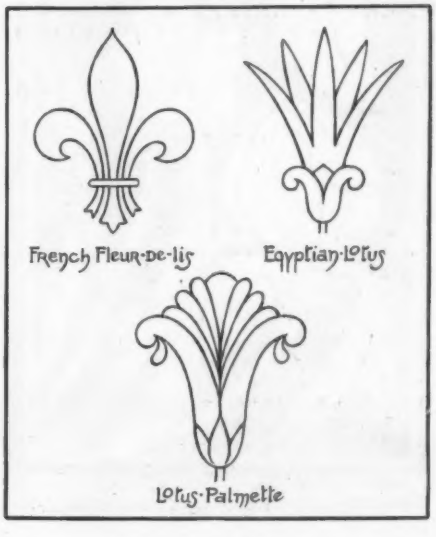
An effective means of decorating the back of the tray is to cover it with a series of spirals, using a small ball of No. 2/0 steel wool, 1 in. in diameter. These spirals are made by giving a ball of 2/0 steel wool, 1 in. in diameter a clockwise twisting motion. Place the tray on a piece of wood so that the bottom does not become depressed during this process, otherwise the metal will stretch and will not maintain a flat surface.

FLOWERS IN BLOCK PRINTING

May Lillian Lampe,
Weehawken, N. J.

Greeting cards, portfolios, repeat patterns, and posters all lend themselves beautifully to flowers done in huge surfaces of white and black, or in colors. Flowers seem to have a language all their own. The poinsettia, or the chrysanthemum, for instance, remind us of Christmas. They are, therefore, fine for Christmas card designs. Lilies, in the same manner, recall Easter. Thistles or fleur-de-lis may be used on posters announcing a school play, and numerous other flowers that have art value may be used in a similar manner.

When cutting a linoleum block for a poster, sketch the idea roughly on a piece of paper cut to the exact size of the linoleum. The letter should be blocked and strong looking. Then trace the sketch in reverse, on the linoleum, using carbon paper. Battleship gray linoleum is desirable to work on. In cutting, remember the spaces to be cut away will be the light areas on the finished print; the linoleum that has been left will be the solid dark places showing the idea or design. Many color schemes can be worked out in flowers. If the cutter does not like the naturalistic forms, he can conventionalize them, thereby getting a more modern and impressive design.



A little historical and general data on the flowers mentioned, follows:

Fleur-De-Lis

It is little wonder that the handsome decorative fleur-de-lis with its delicate, rich coloring of purple, and blue, and dashes of gold, attracted the attention of the French generations ago, and that it has, therefore, played so important a part in the history of both France and England. It has appeared in emblems, banners, and coat of arms during peace and war throughout the centuries, and all because of its exquisite coloring.

As to its origin, outside of heraldy itself, no other flower, except the rose, has been the source of so much admiration and controversy as this celebrated flower. It was adopted and associated with the royal house of France as far back as 1120, when three fleurs-de-lis were sculptured on the capitals of the Chapelle Saint Aignan at Paris. They were used also on a seal by Philip Augustus in 1180. Writers and poets differ widely in their definition of the fleur-de-lis. Some say it is an iris, others a lily, and some say it is distinctly not a part of either. Shakespeare refers to the flower-de-luce as a lily, in the "Winter's Tale" where Perdita is asking for flowers with which to make a garland.

"Bold oxlips and
The crown imperial, lilies of all kinds
The flower-de-luce — being one."

But Spencer separates the lilies from the flower-de-luce, when he writes:

"Strow me the grounds with daffadowndillies
And cowslips and kingcups — and loves lilies
The pretty pawnce.

And the chevisaunce

Fleur-de-lis

Japanese iris or fleur-de-lis arranged according to the three principles: man, heaven, and earth

Shall match with the fayre flower delice."

Lord Bacon also separates them:

"In April follow the double white violet,
The wall flower, the stock-gilliflower, the cowslip,
The flower-de-lices, and lilies of all natures."

As to its origin, one tradition says that Louis VII, King of France, while setting out on his Crusade to the Holy Land, chose the purple iris as his emblem. Thus, it became the flower-of-Louis, or fleur-de-louis, subsequently fleur-de-lis, in more degenerate times. At first the entire banner was covered with these flowers, but later in his reign he reduced the number to three in honor of the "Holy Trinity." During Charles VII reign (1381), and James I, the number also was three.

During the reign of Edward III, in England, this lovely flower was added to the arms of England when, in 1340, the nominal dignity of the King of France was claimed for the English sovereigns.

The roses that emblazon the arms of England were not more a cause of bloodshed than the iris proved to inhabitants of France. It was proscribed during the French Revolution, and hundreds of persons found wearing it were condemned to death. During the time in which this national frenzy had hold of the people, wherever the fleur-de-lis was conspicuously seen in sculptured work, it was effaced. Napoleon substituted the bee in place of the iris flower, but this emblem, as well as the eagle, has now departed. The fleur-de-lis has frequently been allowed to British subjects as a heraldic emblem. During Queen Anne's reign, for example, she granted Sir Cloudesley Shovell for his arms a chevron between two of these flowers, and a crescent at the base, to denote three victories he had gained, that is, two over the French, for which he received a fleur-de-lis apiece, and one over the Turks for which he obtained the crescent.

This lily was also used as a common device in ancient decoration, notably in India and Egypt, where it symbolizes life and resurrection, the attributes of the god Horus. It has been found on Etruscan bronzes, and in Roman and early Gothic architecture, the fleur-de-lis is a frequent sculptured ornament.

But the fleur-de-lis, with its handsome decorative petals, is still a favorite today in all countries, for with its blue-violet variegated veining and waxlike touches of gold, it is very lovely. The French emblem was perhaps

An Egyptian belle, depicting the sacred lotus hair-do, thousands of years B.C.

copied from a cultivated specie, whose inner perianth divisions were large and stood in a nearly perpendicular position. Our American specie lacks this important climax, and more or less resembles the Japanese iris. Blue-violet flowers are scarce, and the perpetuation, in our memories of this one seems to be especially desirable as an inspiration in design.

Scotch Thistle

To the Scotch, the thistle is just as sacred as is the fleur-de-lis to the French and English, and the lotus of the Nile to the Egyptians. According to tradition, the thistle was adopted after it had announced to the Scotch that an enemy was about to attack. The Danes, in making a night attack, were creeping noiselessly toward a Scotch camp. One of their soldiers accidentally set his bare foot upon a thistle. The spines entering his flesh, caused him to shout with pain. This aroused the Scotch giving them time to arm so that they could defeat the attacking Danes. Since that

Scotch thistle

day the melancholy thistle became conspicuous on every banner throughout Scotland. Previously, the thistle had been the badge of the House of Stuart, where the princes were wont to wear the Cluaron, as the thistle was called in Gaelic. In Dunbar's poems, 1460 to 1520, be mentioned, "The Thistle and the Rois." It was written about 1503, when James IV married Margaret Tudor, and in this poem he gives highest honors to the rose.

In the reign of Queen Anne, the Duke of Marlborough made the "lily of France" yield to the thistle of the Queen of England.

The Carline thistle, associated with the name of Emperor Charlemagne, is used as a barometer for the weather in France, England, Germany, and Spain, where it is hung on the door of many cottages. It closes tightly just before a downpour. This Carline thistle is a large, showy flower, entirely surrounded by leaves, and not like the ordinary thistle which grows so plentifully on the waysides in this country.

The Chrysanthemum

The chrysanthemum has probably been known for 2000 years. It was long known in Japan, where it was the national flower. Breynius in 1689 was the first European to mention it. He called it Matricana Japanica Maxima. It was introduced into England in 1789 by M. Pilne Louis Blancard, and the first showing took place in 1790. In 1847 it was definitely introduced into America, and perfected by Dr. H. P. Wolcott, and in the eighties by John Thorpe, who headed the Chrysanthemum Society of America. It has been a favorite in America for years and has been developed so that it grows to tremendous proportions. When all other flowers are gone, when winter is upon us, these lovely flowers are here to cheer us.

The familiar daisy and the marguerite, which are so beloved by the children, are really chrysanthemums and closely related to the magnificent golden flower of Japan.

Chrysanthemum

Poinsettia

In early summer the fields are white with daisies. Some writers say the origin of the daisy is day's eye, meaning the little eye, which opens with the new day, and closes at the setting of the sun. It is quite a feasible conclusion.

In France the daisy is known as the marguerite, meaning pearl. Perhaps we have read of a former unhappy queen of England, called Marguerite of Anjon, wife of Henry the VI, who when young, chose the daisy as her own flower, and that the nobles of her court wore it in her honor. Another and a happier Marguerite, sister of the French king, Francis I, also loved this flower. Her brother, the king, was wont to call her "The Marguerite of Marguerites."

St. Louis chose the daisy and the lily as his device, the former in allusion to the name of the queen, his wife, and the latter with reference to the arms of France.

Not only in England and in France has the daisy been associated with royal personages, for we find it was worn at one period on the continent in honor of Marguerite, the wife of Prince Humbert, first King of United Italy, and during festivities, wreaths in different ways were worn of these dainty flowers in her honor.

The chrysanthemum is used as a decoration in America for social events, and it is unsurpassable as a means of expression in art work. Conventionalized, it is an interesting motif for massive flower arrangements.

Poinsettia

That large and beautifully conspicuous Mexican shrub, called the poinsettia, with bracts or leaves of brilliant red, and greenish-yellow flowers, has become a popular favorite in America. For Christmas and New Year decorations it cannot be surpassed for beauty. Its close relative, snow-on-the-mountain, resembles it in construction. The bracts of the snow-on-the-mountain are white with green touches.

Lotus

As early as 5000 B.C., the sacred lotus lily was used as an architectural decoration. Through gradual conventionalization, it has become one of the most prolific ornamental forms. Its universal use in Egypt resulted from its symbolic association with the Nile, the giver of life. The fourth column of the Egyptian architecture known as the Lotus capital, took form of an inverted bell, with ornaments so undercut as to be distinctly seen only from immediately underneath. This column sometimes called the bell capital, or lotus blossom capital, is the very basic principle of the Ionic order of the Greeks which followed. The lotus flower bird and the palmette forms are also the origin of a great number of Greek painted ceramic patterns, and from them evolved the egg and dart, and the anthemon. The Romans not only borrowed and modified these Greek lotus derivatives, but in Byzantine art the motive appears also in decoration, and up to the twentieth century the influence can safely be traced back through the Renaissance, Medieval Roman, Greek, and western Asiatic art to its source in Egypt.

Egypt used the lotus lily for social gatherings. A lotus flower was presented to each guest. Sometimes servants brought necklaces of flowers, mostly lotus blossoms, as a mark of respect to the host and hostess. A garland put around the head, to which one single bud or a flower in full bloom was attached so as to be suspended over the very center of the forehead, as worn by the Egyptian Queen, was popular. Lotus flowers also were displayed on stands or pedestals.

The Lotus design is used today in decoration. In America the blue-white Egyptian lotus is cultivated in ponds, and resembles the lily of the Nile, with its waxy petals opening as the sun rises, closing when it sets. It still loves the shade, as did the Nile lily before it.

Poppy

That frail, delicate flower, the poppy, is

Egyptian lotus

Poppy

frequently referred to as a symbol of death, probably because of its narcotic properities used for sending people to sleep. Somnus, the god of sleep, was always represented crowned with poppies, or lying surrounded by them, while the garland which bedecked Cere's, the goddess of grain, was made of these flowers interwoven with barley, or bearded wheat. Poppy seeds were offered to her in the sacred rites to secure the prosperity of the crops. In some parts of England, poppies are called corn roses.

The poppy is not a special favorite in America, although it is an extraordinarily beautiful flower. Its petals fall so quickly that it is unsuitable for bouquets. Neither is it fragrant, and its texture is fragile and wanting in endurance. It has become more popular, however, since the World War.

The poppy has heraldic memories and connections too. When the Archduke Maximilian of Austria with his accomplished and beautiful wife, Charlotte, became the ruler of Mexico, they wished to institute an order to be bestowed as a mark of favor on those of their subjects whom they desired to honor. The Empress Charlotte decided that the color of the ribbon of this order should be a bright red. When Napoleon III of France heard this, he objected because he said red was the color of his own order of the legion of honor, and he did not choose to have it copied. Full of spirits the young Empress enclosed a poppy petal, deep red, in a letter to the emperor, and declared that the "order of nature" was before the "order of the legion of honor" and she chose her ribbon from the red of the poppy.

In architecture the poppy has been employed in conventional ornaments in India, and one of the most beautiful finial ornaments in gothic architecture is called poppyhead.

For picturesque qualities, for color, for form, and mystery of character, the poppy is undeniably the most amazing. The varieties within our own land present an astonishing picture of contrast in intense color and gracefulness of line. Our knowledge of the poppy is really limited, as we have no truly wild species. All of our poppies come from the old world, England, Scotland, France, and Italy. The state of Pennsylvania boasts of a beautiful deep pink variety.

The Icelander, a deep buttercup, yellow and orange, and white, named in honor of Lieutenant Perry, was found growing in the frosty fields of Greenland.

The Japanese pompon, which is a different type from the opium poppy, appears to have been spun from soft china silk, and the Mexican variety, a dainty, transparent, white flower with a golden center, is very beautiful. A panel of poppies in art has decided decorative possibilities.

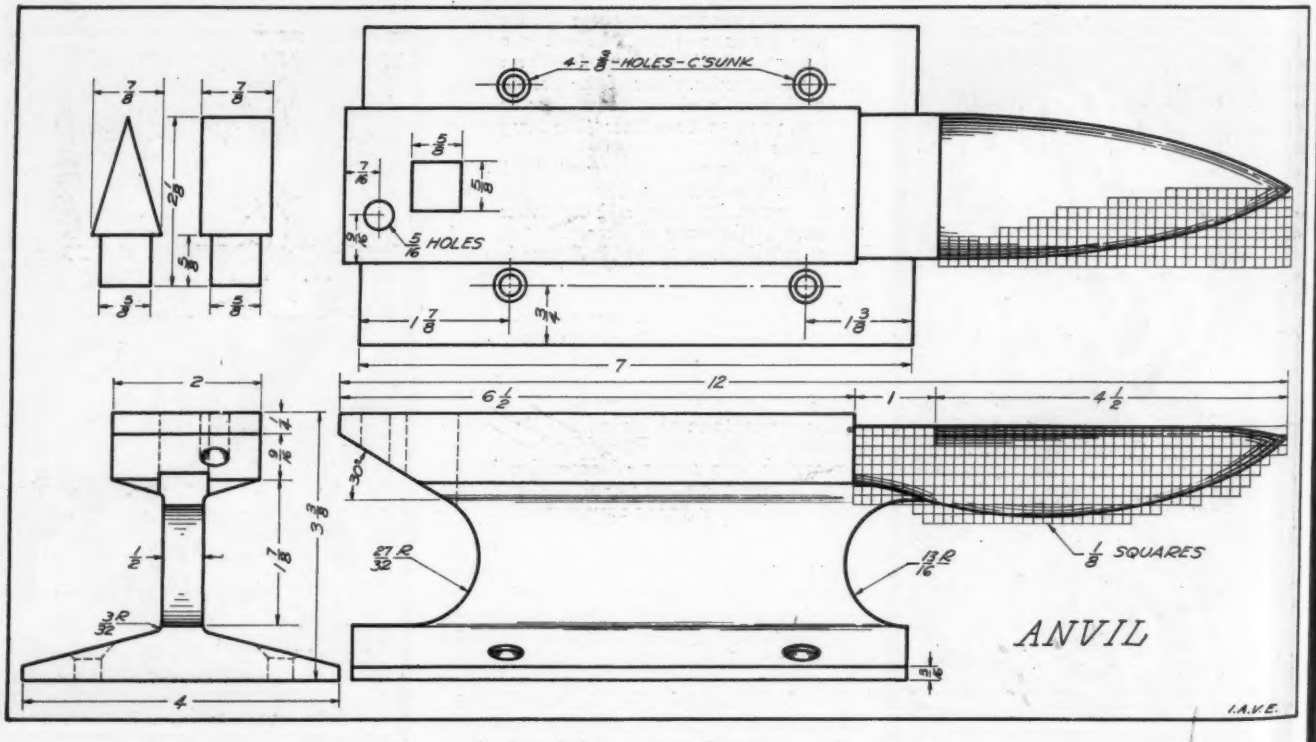
ANVIL

R. E. Murray,
Co-ordinator, Public Schools,
Fremont, Ohio

The anvil described herewith is an inexpensive metalworking project which appeals to both students and adults alike. It will prove useful around the school and the home workshop.

An ordinary size streetcar rail is used and in the event a larger anvil is desired rails in various sizes may be obtainable and worked out on a proportional scale. As a rule this project is not prohibitive in cost as same may be obtained at a small sum from the local junk dealer or the maintenance department of a railroad.

This project provides a number of diversified and logical operations which may be performed either by hand or by machine.



Anvil made from a piece of street-car rail

Steps of Procedure

1. Cut to length approximately 12 in.
2. Lay out center lines for the 27/32 in. radius.
3. Lay out center lines for the 13/16 in. radius.
4. Drill to conform to these two radii.
5. Rough shape radii.
6. Cut base to length.
7. Finish radii with milling cutter.
8. Forge and offset horn.
9. Finish other radii with milling cutter.
10. Finish side to dimensions.
11. Rough grind horn.
12. File horn to finish.
13. Punch and drill 5/8-in. hardy hole.
14. Drill 4 3/8-in. countersunk holes in base for anchorage.
15. Heat-treat and sandblast.
16. Shape hardy block to dimensions.
17. Harden same.
18. Polish machine surfaces with fine grade of emery paper.
19. Paint webb and base.

A FEATHER AIRPLANE

Terence Vincent,
Ypsilanti, Mich.

The airplane described herewith is a novelty which may have little value, but it does show that man can use feathers for flying just as birds have used them for ages.

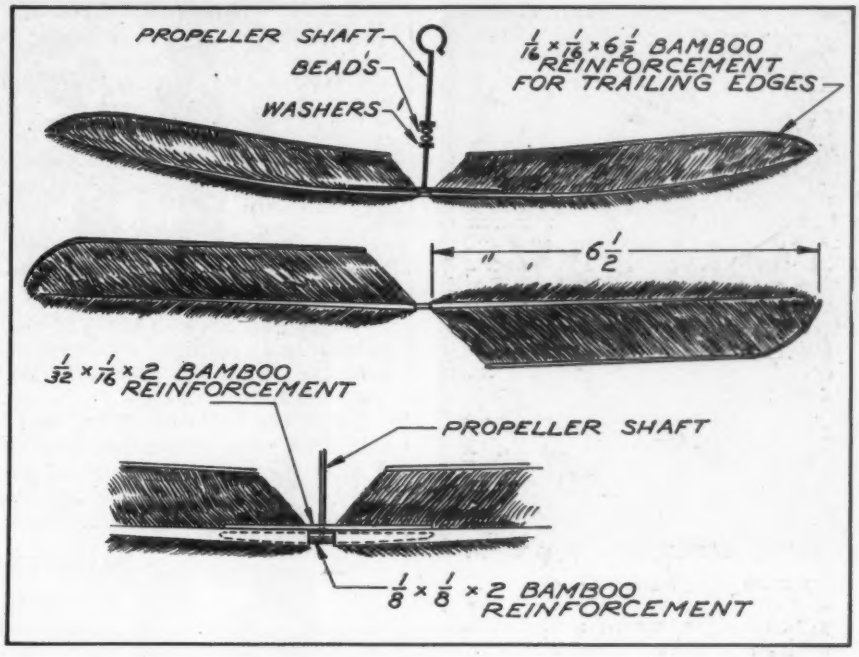

PROPELLER SHAFT
BEADS
WASHERS
1/16 × 1/16 × 6 1/2 BAMBOO REINFORCEMENT FOR TRAILING EDGES
6 1/2
1/32 × 1/16 × 2 BAMBOO REINFORCEMENT
PROPELLER SHAFT
1/8 × 1/8 × 2 BAMBOO REINFORCEMENT

Fig. 3

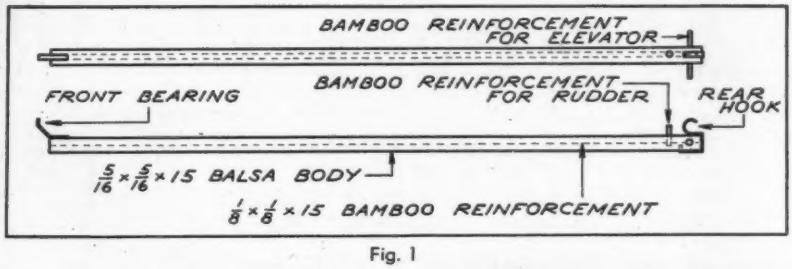

BAMBOO REINFORCEMENT FOR ELEVATOR
BAMBOO REINFORCEMENT FOR RUDDER
FRONT BEARING
REAR HOOK
5/16 × 5/16 × 15 BALSA BODY
1/8 × 1/8 × 15 BAMBOO REINFORCEMENT

Fig. 1

This airplane is quite simple to make. Figure 1 shows the 5/16 by 5/16 by 15-in. balsa body, which is reinforced at the bottom with an inlaid strip of 1/8 by 1/8 by 15-in. bamboo. This Figure also shows the front bearing and the rear hook, as well as the bamboo reinforcements upon which the rudder and elevators are mounted.

Figure 2 shows how the wing feathers are fastened to a 1/8 by 3/8 by 3 1/2-in. hard balsa wing mount. The two wing feathers, previous to fastening to this mount are joined together in the same manner as that used for fastening the propellor feathers together. See

Fig. 5

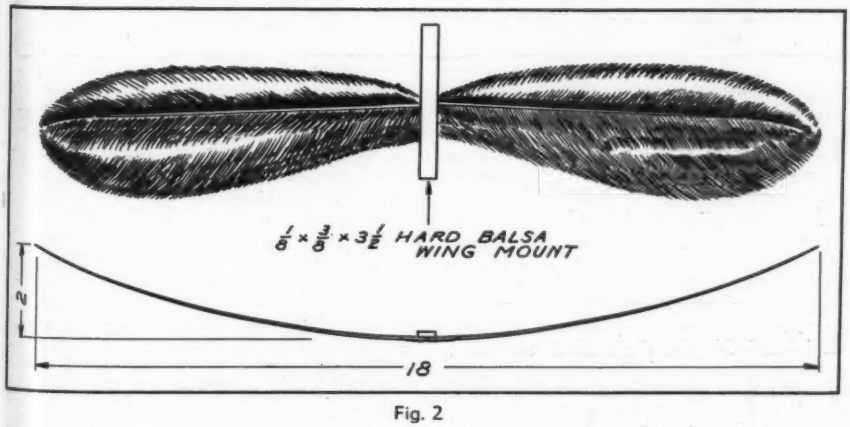


Fig. 2

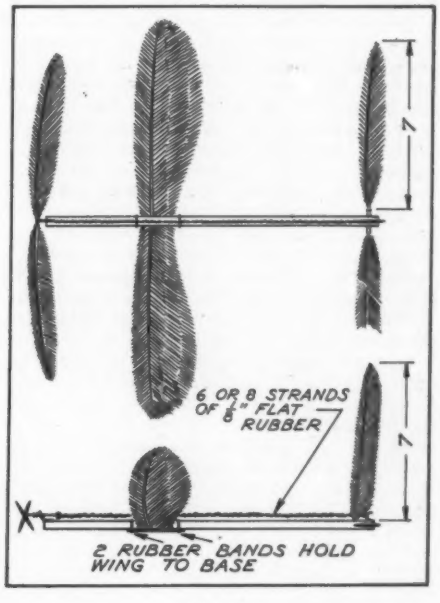


Fig. 4

Figure 3.

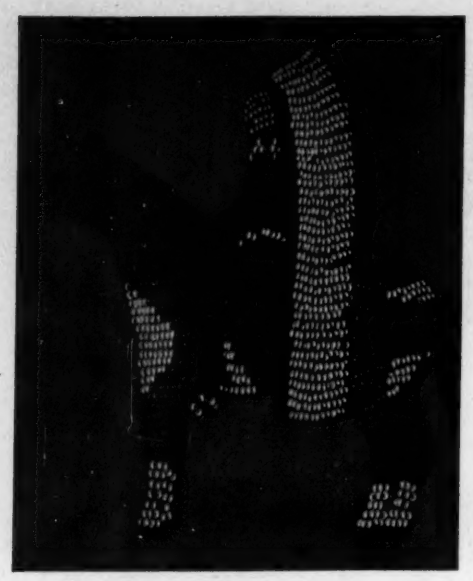
Figure 4 shows the side view and top view of the plane. A study of the various illustrations will be sufficient for more to make this plane.

If additional information is wanted, probably a reference to the article, "Simple Airplanes," page 185, May, 1929, issue of INDUSTRIAL-ARTS magazine, may be helpful.

INDIAN AND RODEO VESTS

W. Ben. Hunt,
Hales Corners, Wis.

In the West, colorful vests are always in style, especially during the summer season. Somehow or other, they seem to be a part of that country.



Example of a beaded project

The Indian is probably responsible for them even though he did get the idea of a vest from the white man. But he put it across and today anyone would be proud to own and wear a beautiful beaded vest.

Full beaded vests are a lot of work and cost a lot of money. One can buy them now and then for from fifty dollars and up. But partly beaded vests are also attractive and can be made in much less time. For Indian costumes, the partly beaded vests are eye catchers, especially when a nice piece of leather is used. If the leather is rather soft, do not have more than eight beads on a string. Sometimes an Indian will make a full-beaded vest with every two or three beads sewed down, that is, two or three beads to a string. Such a vest is worth a lot more than one with long strings of beads. One should always use waxed thread, and it should be as heavy as the holes of the beads will allow.

In regard to the calfskin vests, of course, a great deal depends on the skin itself. The best way to get a good skin is to buy it fresh from the butcher and have it tanned. Unborn calfskins are not plentiful but leather dealers usually have a few on hand. The hair on them is very short and smooth and just the thing for vests. One skin will usually be sufficient to make a vest.

When making vests of small pieces of leather, it may be impossible to get a piece large enough for the back of the vest. In that case, piece it down the center of the back. If the vest is to be sewed by hand, use glovers needles. They have a triangular point and cut their way through the leather. Use waxed thread for hand sewing. For machine sewing, a good strong thread and a fairly long stitch should be used.

INDIAN AND RODEO
Attractive Indian and rodeo or cowboy vests are easily made and are well worth spending a lot of time on. One rarely finds two hand made vests alike. Therefore do not try to copy the ones shown here, but using these ideas, try to make your vest different.
By far the best and safest way to get your pattern is to take it from your own vest or one that fits you. It need not be ripped apart. Lay it on a piece of heavy wrapping paper, trace around and allow about ¼ inch wherever there are seams. Then lay the pattern on the material, mark and cut it. These vests should fit rather loosely.
BUCKSKIN VESTS ···
Most vests can be made of 3 pieces – the two front pieces and the back.
Two piece pocket
Fringed trimming
If thin buckskin is used, it is advisable to line it with cloth, as buckskin sometimes has a way of pulling out of shape. Split cowhide, calfskin, and suede leather does not stretch so readily. Edges may be finished or bound in several ways
-1-
-2-
-3-
-4-
CALF SKIN VESTS ···
These are usually made of unborn calf skins. Spotted black and white or brown and white, make the nicest vests. The edges are bound with some thin leather such as suede leather, sheepskin or thin calf or horsehide.
Binding leather can be cut with a pinking shears.
A red lining was used in this vest to add color to it.
Vests made of calf or buckskin can be sewed by machine without trouble.
The back of this vest was made from the center of the hide and the front was matched as evenly as possible from pieces cut from the edges or belly section. The edges are bound with thin horsehide.

ART METALWORK

V. P. Conners,
South Bend, Mass.

Selection of Design

Art metal, like all studies, must begin with the most simple and elementary steps or operations.

The first thing after choosing a problem is to decide on the design that is to be used. The difference between a piece of work that commands a high price and one that doesn't is usually a matter of design. The amateur or beginner, untrained or unschooled in design, has to depend entirely upon designs made by others. Design sheets may be obtained from almost any reliable metal supply house or they may be gotten from the local library. Originality and clever use of design is what makes the true craftsman. Lines and spacing depend upon design which in turn decides the metal to be used and the gauge of that metal. A simple or elementary project well designed will be distinctive and pleasing to the eyes.

It is advisable for the student to start a scrapbook of tracing and clippings from magazines and newspapers or to subscribe to a metal journal that will supply added information on both processes and projects. The reading and studying of the works of prominent metalworkers such as Benvenuto Cellini and our own Paul Revere will add much to the student's knowledge and vocabulary. Visiting metal exhibits or metal plants will give one new ideas and show one how the craftsman works at his trade.

Once the design has been decided upon, it must be transferred to the metal. There are several ways in which this transfer may be made.

1. The design may be glued onto the metal, and the piercing or chasing done while it is in this position.
2. The tracing or original can be secured to the surface with rubber cement.
3. The design may be transferred onto the

BEADED INDIAN VESTS

Beaded vests are usually made of smoke tanned buckskin, but that is rather hard to get. A full beaded vest can be made of any soft leather because, unless left unlined, no leather shows. For a partly beaded vest, any soft leather that has had the grain or scarf skin removed may be used. It should be natural or buckskin color. The beads are sewed directly onto the leather in strings of from two to six or eight beads as shown below. Draw outline of figures onto leather with a pencil.

COLORS OF BEADS
Eagles - blue & white.
One horse - dark blue & white. One, orange.
One Indian, red, the other, yellow.
War bonnets of white & black beads.
Lower band, dark blue edges, red & yellow tapees
Buffalo, of very dark blue beads.
Red flannel binding.

A PARTLY BEADED VEST

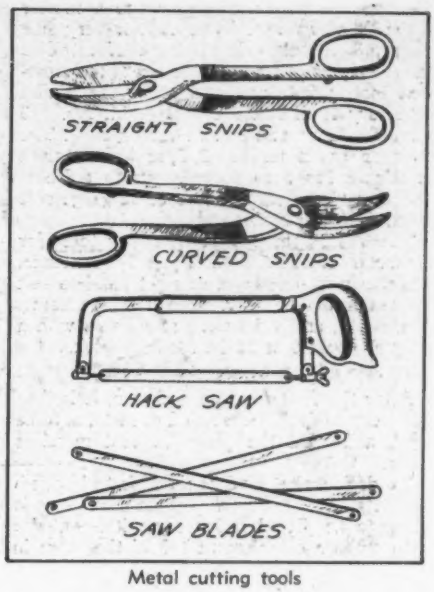
This type of vest is very attractive and is not very difficult to make. The Sioux vest shown is very similar to the one given to the duthor by Chief Lone Eagle. Two methods of sewed bead work are shown in the two vests on this page. The beads on both vests are sewed directly to the buckskin, but as you will notice, they are sewed in almost any direction in the animal and bird designs, while in the geometric designs they are all laid in one direction, except at the neck and arms of the one shown below. While most Indians fasten the sinew as shown below, some, like the Crows sewed through the leather. Modern Crow beadwork is sewed with thread. When sewing with thread do not put more than eight beads to a stretch. Using sinew, as many as ten to fifteen beads are strung between fastenings.

Draw guide lines with a pencil to insure even work. You may have to add a bead to a string now and then to even up the line.

For ceremonial purposes, vests can be made of suede or split cowhide and the designs carefully painted on with bright colored enamels. Sometimes you will have to give it a second coat, if the leather is very porous.

A FULL BEADED VEST

Here is something you can really sink your teeth into. It's a real job for anyone and worth the effort. Note how the sides are cut. White or turquois beads make a dandy background.



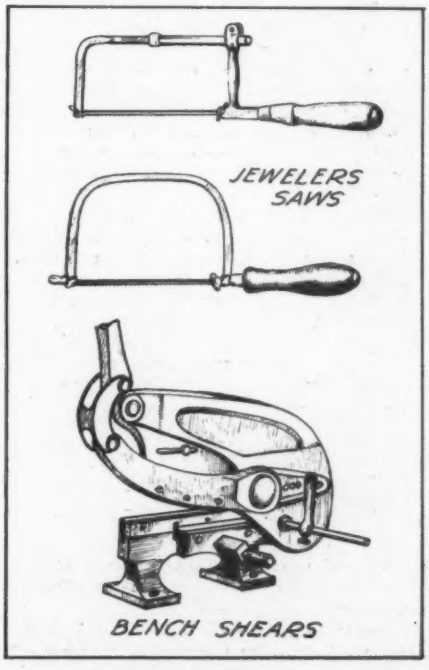
Metal cutting tools

waste is used on bright steel; chalk, file marks or slate pencil for black iron. There are other methods of transfer but they are used only in the trade.

Cutting Metals

Tinsmiths' shears commonly known in the trade as snips come in various lengths, the most practical having a 2" or 2½-in. blade and an overall length of 12 in. Snips also come either left hand or right hand and both straight and curved. Straight snips are used for inside curves and trimming of bowls, vases, etc. Snips are always held at right angles to the metals. Never turn the snips, always turn the metal as you cut.

Just as a matter of general knowledge, cold chisels and hack saws are sometimes used, but their use is mostly confined to the trade and so is of little interest to the beginning craftsmen.



Metal cutting tools

metal by means of carbon paper, the tracing being done with a scriber, sharp nail, ice pick, or an awl.

4. The metal may also be coated with Chinese white water color. After this is dry, the design can be transferred onto the white surface by means of carbon paper.

Before transferring the design, see that the metal is absolutely clean. It is essential, for instance, that the metal be freed of the oil that is used during the rolling operation. All metal possesses a fine grain and into this oil or grease has been rolled. Because of this, the cleaning cannot be carried out too carefully. Prepare a strong cleansing solution by adding about a pound of soda or potash lye to a pail of boiling water. Dip the metal into the solution, or apply the cleansing agent to the surface of the metal with a brush, scrubbing it well. Next rinse with clean hot water and finally cold water. Another method consists of rubbing fine pumice powder over the surface with a scrubbing brush that has been wet with water. Then rinse well.

Methods 1 and 2 of transferring the design are fine, if we do not want to save the original design.

Number 3 is one of the ordinary practices for copper and brass.

Number 4 is used on pewter, silver, aluminum or German silver.

Dilute copper sulphate applied with cotton

A hand tool which the beginner must master is the jeweler's saw. With this, a very fine blade and a steady hand, work of intricate design may be produced. This saw is the most-used tool in jewelry making. The saw blades used vary from No. 8/0 to No. 14, No. 8/0 being the finest and No. 14 the coarsest. The beginner should use Nos. 2, 3, or 4 blades until experience has been gained. The first job is best carried out with No. 18 or 20-gauge soft rolled copper or brass.

The two or three most necessary tools for the metalworker's kit are: 1 pair 2½-in. blade, straight snips, left hand or right hand to suit the needs of the user, jeweler's saw frame, 5-in. swing, and 1 jeweler's saw frame with a wing of about 8 or 10 in. for long work.

Selecting and Buying Metal

After the design has been chosen, it is then necessary to decide what kind of metal is to be used, and what the gauge of that metal is to be.

To decide what kind of metal is to be used, one must consider where the finished piece is going to be placed. What must it harmonize with or be a complement to? If the room in which it is to be placed is of a definite period, then the metal should be the one most frequently used at the time of which the period is representative. If, on the other hand, the room is one that cleverly combines many periods, this must be considered and the metal chosen accordingly.

Then the question is, how heavy will the metal have to be, that is, what gauge will have to be used? The gauge, heavy or light, is chosen according to the amount of use the article is going to receive; thus a bracelet must be very light because one would not want a heavy load on the wrist. In like manner, a tray or bowl would have to be heavier to stand the wear.

Troy Weight

24 grains	1 pennyweight
20 pennyweight	1 ounce
12 ounces	1 pound

This table is used in weighting gold and silver. When buying gold or silver, figure out the quantity required as near as possible because of the cost of our waste.

Following are some suggestions for the beginner in selecting the gauge for the articles which he wants to make.

Pewter Platework

4-in. ash tray	18 B and S Gauge
5-in. tray or bowl	18 B and S Gauge
6-in. bread and butter plate	16 B and S Gauge
8-in. salad plate	16 B and S Gauge
10-in. dinner plate	14 B and S Gauge
12-in. chop plate	12 B and S Gauge
fork ends	14 or 16 B and S Gauge

Pewter may be bought in sheets 18 by 24 in., or disk 2, 4, 6, 8, 10, 12 in., and of Nos. 14, 16, 18, 20, and 22 in., B and S gauge.

Copper and Brass

4-in. ash tray	20 B and S Gauge
5-in. tray or bowl	18 B and S Gauge
6-in. plate or bowl	18 B and S Gauge
8-in. plate or bowl	18 B and S Gauge
10-in. plate or bowl	18 B and S Gauge
12-in. plate or bowl	18 B and S Gauge
book ends	18 B and S Gauge
letter opener	16 B and S Gauge

Since the gauges used for art metalwork are confined usually to those between 24 and 12, only that part of the American or Brown and Sharpe Gauge is given herewith.

Copper, brass, pewter, morel, and nickel silver are bought by the pound. Example: 5 lb., 20 gauge copper. The sheets run in standards widths. Gold is bought by the pennyweight, and silver by the troy ounce.

AMERICAN OR BROWN AND SHARPE GAUGE

No. of gauge	Thickness in approximate decimals and fractions of an inch	
	Decimals	Fractions
12	.0808	5/64 +
13	.0720	5/64 −
14	.0641	1/16 +
15	.0571	1/16 −
16	.0508	3/64 +
17	.0453	3/64 −
18	.0403	3/64 −
19	.0359	1/32 +
20	.0320	1/32 +
21	.0285	1/32 −
22	.0253	1/32 −
23	.0226	1/64 +
24	.0201	1/64 +

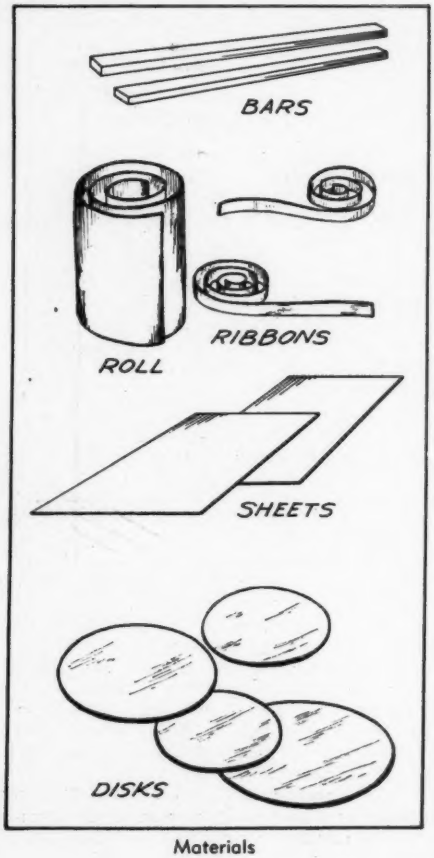
Copper and brass are obtainable in sheets, disks, and strips. Soft sheet copper (cold rolled) is preferred for drawing purposes. This sheet copper also can be easily washed and polished. Twelve gauge is used for hardware and hinges. Sixteen gauge is used for large bowls. Eighteen gauge is used for general work. Twenty gauge is used for small pieces and twenty-four gauge for lanterns, boxes, and the like. Brass of the corresponding gauges may be used for the same jobs as listed for copper.

Bracelets of this material may be made of silver 18 to 20 B and S gauge. This metal comes in sheets, strips, disks, and wire and usually in gauges of 14, 16, 18, 20, 22, 24, and 26.

These recommendations are to be used only as suggestions and should be varied according to the needs of the project to be made.

Piercing or Use of Fret Saw

After selecting the material that is to be used, and after having transferred the chosen design upon it, the next step is to learn how piercing is to be done. In piercing metal, areas or shapes are removed by means of various kinds of tools. The tools needed comprise the following: jeweler's saw frame; 1 doz. jeweler's blades, No. 2, 3, and 4; center punch or scratch awl; small hand drill; set of assorted drills; V block and V board; and 1/16-in. solid punch.



Materials

Method of Procedure

1. Make a tracing of the design so that it may be used for reference. The design for beginners should be very simple, omitting difficult curves and angles.
2. Transfer design to metal using one of the methods described before.
3. Into the areas that are to be removed make a small impression with a center punch or brad awl.
4. At these impressions and by means of a small drill, make a hole. This will be used to put your saw through.
5. If a 1/16-in. solid punch and a lead block is available, a hole may be punched into each of these areas. In this case step 5 takes the place of steps 3 and 4.
6. Select a saw, adjust frame so that when it is tightened the blade will be stretched enough to stand the strain of sawing.
7. Place the saw blade into the frame with the teeth pointing downward toward the handle. In cutting metal the saw works on the down stroke.
8. The work is supported on the V board. The board has a triangular opening and is sometimes called a bench pin, or fish tail due to its appearance.
9. Place the head of the saw against the workbench, and the handle against your body.
10. Put the saw blade through one of the holes, keeping the designed part facing away from you.
11. Press with body until saw is brought to end of frame, then tighten the holding screw.
12. Now place the metal on the V board with design up and you are ready to saw.
13. The saw is held in a vertical position. One hand holds and guides the saw, and the other holds the metal. The elbows of the arm used to hold the saw is rested on the leg just above the knee. The cutting is done by use of the wrist, the saw moving up and down.
14. Rules for sawing.

a) Keep saw in a vertical position.
b) Don't crowd or hurry the saw.
c) Don't stop in middle of line, keep on until you come to a drilled hole.
d) Never turn the saw. Turn the metal with left hand as the saw is kept going with the right hand.
e) Work the saw slower when in tight places.
f) Follow design carefully keeping on the line or just outside of the line in the waste metal.
g) If many saws are breaking, rub paraffin or wax on the blades. This stops overheating.

When design is all sawed out, examine carefully to see if filing is necessary. Work well done will not need filing, because a few saw marks are an indication that the piece was made by hand. The beginner will have to resort to filing for his first few jobs.

Swiss jeweler's files of many shapes have been designed so that one may be found to finish the very smallest piece of jewelry. It is most important that a file be chosen which fits the shape of the surface on which it is to be used. This will cut down work and help to maintain the design. In using a file, put enough pressure on the forward stroke to make

it cut. Do not bear down on the return stroke.

If metal filings stick to teeth of file, rub chalk or charcoal into the file. Keep files clean by using file card or wire brush. Use round or half-round files for circular cuts, knife files for narrow slots or cuts, flat and pillar files for flatwork and convex surfaces, and square files for right angles and slots.

When the filing is complete, the metal should be cleaned. Then the job is ready for the next step, if one is required. If this is not the case, then it is to be polished either by buffing or by hand, after which it should be lacquered.

(To be continued)

PRINTING TEACHERS GIVE VIEWS IN SYMPOSIA

R. Randolph Karch,
Principal, Printing High School, Cincinnati, Ohio

Presswork Symposium for Junior High Schools

1. Just how far can an adequate "insight into the industry" be had in shops equipped with platen presses only?

An adequate insight can be had in a shop equipped with platen presses, since the basic principles of presswork can be taught on platen presses. Through graphs, charts, pictures, and brief lectures, the principles of other types of presswork can be taught.

2. Should all students be required to know how to feed a platen press? At what minimum speed, to register?

Except in special cases of advanced students, presswork should not be taught to beginning students.

3. Students of what grade should learn the operation of platen presses?

Students who are to learn the operation of platen presses should be selected on their individual ability rather than on their grade.

4. Where production is a problem, how can the pressroom best be run to "get out from under"?

5. To what extent should make-ready be taught to students of this level of education

6. On rush jobs, should the teacher do all make-ready Why?

Production in junior high school should be discouraged so that it will not be a problem; only the elemental principles of make-ready should be taught. If rush jobs become necessary, the teacher should do the make-ready because there is not time to adequately instruct a student. However, where jobs to be produced are standard forms, these can be kept standing, or electrotyped, and production organized to save a considerable amount of time.

7. Does adequate instructional material exist, or should the teacher teach by word of mouth and by demonstrations?

At present instructional material for the junior high school level is inadequate. The instructor teaches mostly by word of mouth and by demonstration. There is a need for the development of instructional material, such as lesson sheets.

8. Can standards be set up for adequate presswork instruction?

Yes. Each teacher should work out standards of teaching presswork according to the needs of his individual school based on the junior high school objectives.

10. Should the teacher in this type of school be an experienced craftsman in presswork? Is much practical experience necessary?

No. In the junior high school level we are giving the student experience in printing as a part of a general education and expert pressmen are not required.

11. What safety measures can be taught, and how can this teaching best be done?

Every machine should be placarded with a safety warning. Every student before operating a machine should be given a safety lecture and demonstration. All possible safety devices should be installed on every machine. If possible, presses should be separated from the rest of the print shop.

14. What can the teacher do to keep up with the advance of presswork?

By reading printing magazines, going to printing-teachers' conventions, seeing manufacturers' exhibits, making trips to local commercial shops.

17. Is there any instructional value in feeding a platen by hand, after the student has learned the necessary skills? Is this a prevalent practice? Why?

No. As many students as possible should be given an opportunity to learn the basic skills.

20. What can the teacher-training institutions do to help teachers of printing in this area?

There is a need for more shop-teacher training courses rather than theoretical work, especially on the graduate level, to meet the legal requirements for certification or promotion.

21. Is supervision of printing teachers on high plane? Is undue difficulty had with scheduling, getting adequate supplies, production, etc.?

Supervision, on the whole, does not meet the needs for inspiring leadership. There is not much difficulty with scheduling; and but a few schools have difficulty in getting adequate supplies.

Presswork Symposium for Senior High Schools

1. Just how far can an adequate "insight into the industry" be had in shops equipped with platen presses only?

That for industrial-arts instruction, platen presses are sufficient, and that sufficient "insight into the industry," for such a course can be given by shop visits, lectures, and trade literature.

2. Should all students be required to know how to feed a platen press? At what minimum speed, to register?

All industrial-arts students excluding exceptional cases should do some feeding of the platen press. The speed should depend upon the individual student and the nature of the job or exercise on which he is working.

3. Students of what grade should learn the operation of platen presses?

Students of any grade in the senior high school are eligible to learn platen-press feeding. (One member favored excluding all below eleventh grade.)

4. Where production is a problem, how can the pressroom best be run to "get out from under"?

Legitimate devices are: to set and print similar jobs in gangs wherever possible; to avoid time lost in washing up by running all jobs of the same color at one time; to print the routine school forms and stock them ahead of their being needed; and to resist undue pressure of production by declining too much production.

5. To what extent should make-ready be taught to students on this level of education?

The minimum should include setting guides to register, getting the ink and packing at least approximately correct; and, where time is available, additional instruction should be made in making ready forms which include plates up to half tones, as well as cutting dies and perforating rule.

6. On rush jobs, should the teacher do all make-ready? Why?

The teacher should leave the make-ready to students on all jobs, confining his work to supervision and instruction.

7. Does adequate instructional material exist, or should the teacher teach by word of mouth and by demonstrations?

Adequate instructional material does exist. Some of it is compiled and arranged by the individual instructors themselves. It should be used with a minimum of demonstrations and word-of-mouth teaching. A few members were in favor of more instruction and demonstration.

8. Can standards be set up for adequate presswork instruction?

The standard should be the nearest approach to commercial work as possible with the available equipment, time, and students.

10. Should the teacher in this type of school be an experienced craftsman in presswork? Is much practical experience necessary?

For an industrial-arts course, a teacher should have considerable trade experience, either in a commercial shop or in a training school, but journeyman standing in the trade although desirable is not necessary on that level.

11. What safety measures can be taught, and how can this teaching best be done?

On the platen press, one important safety measure is to locate presses so that students cannot get behind them while the presses are running. Another is to teach students to stand erect while feeding a platen press so that the platen will pull away from him as the press closes up. Another is to allow only one boy near a press at a time. All presses should be adequately guarded by belt guards and guard rails so that only the feeders can approach them. Brief and pointed safety talks may be given. Sleeves should be rolled up, flowing ties and loose garments should be discarded, and all hand jewelry eliminated before feeding the press. Inks and materials for cleaning the press should be kept in proper fireproof receptacles.

12. In the senior high school shop, what can be stressed to really take an adequate step beyond the work of the junior high school?

There should be more responsibility placed on the student. The course should be broader. The requirements for accuracy should be more stringent.

13. Can the installation of automatic presses be justified?

No.

14. What can the teacher do to keep up with the advance of presswork?

He should read trade journals, keep in constant touch with the commercial shops, attend meetings of trade and industrial organizations where improvements in presswork are discussed and pursue advanced presswork courses in educational institutions where possible. He should use his contacts with salesmen of supplies and equipment to the fullest extent in keeping in touch with the industry.

15. What can be done to make contact with employing printers in the use of graduates in the pressrooms?

Contact with employing printers can be

had by visits to industrial plants and through membership in trade associations.

16. Should presswork teachers attempt to write, edit, and print their own instructional material? Or should they secure a good text and prepare lesson material around it?

He should supplement or adapt the published text to his own situation or prepare his own, according to his particular situation.

17. Is there any instructional value in feeding a platen by hand, after the student has learned the necessary skills? Is this a prevalent practice? Why?

For developing a certain amount of perseverance, there may be some value in continuing the practice after he has acquired the necessary skills. The practice is unjustified if it becomes exploitation.

19. How should students be scheduled for this work? Should the course be concentrated in one or two semesters, or spread out over a period of several years?

In order to avoid too long a break between the instructional periods, the student should be scheduled for a fairly concentrated course rather than one which is spread out.

20. What can the teacher-training institutions do to help teachers of printing in this area?

Teachers' colleges might offer advanced shop courses for graduate credit; or administrative boards might recognize such courses as equivalent to graduate courses in professional development of printing teachers who already have degrees. Three members disagreed and several members did not vote.

21. Is supervision of printing teachers on a high plane? Is undue difficulty had with scheduling, getting adequate supplies, production, etc.?

Supervision of printing teachers is not generally on a high plane. Unnecessary difficulty with scheduling, or with getting adequate supplies and production is not a general condition.

Presswork Symposium for Vocational Schools

4. Where production is a problem, how can the pressroom best be run to "get out from under"?

The instructor should be the judge of the job that would be run with respect to the students' work.

5. To what extent should make-ready be taught to students of this level of education?

It was decided that it would be well to teach everything possible to students about make-ready granting that there is the necessary equipment to do so.

6. On rush jobs, should the teacher do all make-ready? Why?

The teacher should complete the make-ready if the student is unable to do it soon enough.

7. Does adequate instructional material exist, or should the teacher teach by word of mouth and by demonstrations?

Yes, adequate instructional material does exist. Demonstrations should be used with instructional material as a supplementary aid.

8. Can standards be set up for adequate presswork instruction?

Yes, if all plants were the same size, it would be possible to organize a course of instruction. For each individual press a standard could be set up. In setting up standards, it is necessary to take into consideration the ability of the student, of the instructor and the type of equipment being used.

9. In a platen press shop, what can students be taught about automatically fed platens, cylinders, nonoffset guns, mechanical overdays, etc.?

Teach the theory of presswork on a platen press, and have observational demonstrations of the other types of equipment mentioned. It would be necessary to teach some students in more detail.

10. Should the teacher in this type of school be an experienced craftsman in presswork? Is much practical experience necessary?

The teacher should be an experienced pressman and possess much practical experience in the trade.

11. What safety measures can be taught, and how can this teaching best be done?

It was suggested that the Tables of Safety Measures which R. Randolph Karch has set up are very fine. There is, also, the Hartford Insurance setup, from whom several posters may be obtained depicting accidents that have occurred. Lectures and demonstrations are very effective.

13. Can the installation of automatic presses be justified?

Yes, it can be justified. When preparing students for industry, there should be an effort to duplicate the things they will be confronted with in industry.

14. What can the teacher do to keep up with the advance of presswork?

a) Go into industry and do actual work.

b) Attend clinics.

15. What can be done to make contact with employing printers in the use of graduates in the pressrooms?

Visit pressrooms and mingle with the craftsmen. Send out post cards previous to graduation.

16. Should presswork teachers attempt to write, edit, and print their own instructional material? Or should they secure a good text and prepare lesson material around it?

Yes, if they have time and sufficient personal experience on problems.

17. Is there any instructional value in feeding a platen by hand, after the student has learned the necessary skills? Is this a prevalent practice? Why?

There is instructional value to feed a platen by hand, because practice is needed in order to secure the necessary skill or speed.

19. How should students be scheduled for this work? Should the course be concentrated in one or two semesters, or spread out over a period of several years?

Students should spend several months in different areas and then compile all data and have someone decide what he is best equipped to do.

20. What can the teacher-training institutions do to help teachers of printing in this area (presswork)?

It would be well to offer practical courses which would help the teacher put across ideas to the students.

21. Is supervision of printing teachers on a high plane? Is undue difficulty had with scheduling, getting adequate supplies, production, etc.?

It was decided that if teachers are practical it is best to leave them alone.

INSPECTION LISTS FOR INDUSTRIAL-ARTS SHOPS

*Hiram E. Jackson**

The following lists were developed in an effort to systemize the checking of the various industrial-arts shops and laboratories. Safety measures are stressed above everything in the inspection matters and, therefore, appear first in each of the lists.

*Head of Department, Greusel Intermediate School, Detroit, Mich.

Machine, Wood, Auto, and Print Shops

Safety

1. Fire drill:
   a) Poster in each shop near exit door giving fire-drill instruction.
2. Movies and slides.
3. Definite rules and regulations.
4. Posters.
5. Do no altering of electric wiring in any school building.
6. First-aid cabinet.
7. Health:
   a) Have proper light, heat and ventilation in each room.
8. First-aid supplies should be kept by Head of Department and handed out as needed.
9. Demonstrations on first aid and bandaging.
10. Storage of gasoline, turpentine, oil, and paint in metal cabinets. (City fire ordinance.)

Teaching Organization

1. Division of each class lesson for specific purposes.
2. Have a term schedule for lessons on related information.
3. Course of study.
4. Progress charts.
5. Foreman charts.
6. Job sheets.
7. Demonstrations.
8. Tests.
9. Pupil homework.
10. Showcase exhibits.
11. Annual exhibit.
12. Convention exhibit material.
13. Textbooks.
14. Visual aids.
15. Museum exhibits.

General

1. Attractiveness of rooms.
2. Inspection of tool equipment.
3. Consultation with teachers preferably before morning home-room period.
4. Supplies.
5. Watch for physical defects of students.
6. Storing of work in progress.
7. Tool check system.
8. Representation on school paper.
9. Requisitions:
   a) Emergency on zone delivery.
   b) Regular on general delivery.
10. Outside visits to schools and industry.
11. Relation to other departments of school. Things to be made in shop department should be requisitioned by department head.
12. Models.
13. Clubs.
14. Extracurricular activities.
15. Hobbies.
16. Proper wash equipment.
17. Collection of salvage material.
18. Red Cross toys.

Drafting Rooms

1. Fire-drill instructions.
2. Course of study.
3. Demonstrations.
4. Check of instruments.
5. Storing of envelopes.
6. Exhibit of students drawings.
7. Heat, light, and ventilation.
8. Tests.
9. Blueprinting.
10. Special work for advance students.

Cooking Laboratories

Safety

1. Fire-drill instructions.
2. First-aid cabinet.
3. Fire blanket.
4. Gas stove leaks.
5. Match storage.

General

1. Course of study.
2. Demonstrations.
3. Garbage disposal.
4. Grocery bills and orders.
5. Storing of supplies.
6. Water leaks in sinks.
7. Exhibit material.
8. Text material.
9. Recipe books.
10. Tests.
11. Requisition broken equipment immediately.
12. Left-over foods to be disposed of to welfare clients.
13. Domestic help.
14. Red Cross donations of jams and jellies.

Sewing Rooms

1. Fire-drill instructions.
2. Storing of individual work in boxes.
3. Storing of supplies.
4. Course of study.
5. Demonstrations.
6. Visit to model demonstrations.
7. Checking of equipment in each class.
8. Wall exhibit.
9. Red Cross and welfare help.
10. Progress chart.
11. Sharpening scissors.

ELECTROCOATED WATERPROOF ABRASIVE PAPERS FOR FURNITURE FINISHING

Ray A. Wigen,
Instructor, Painting and Decorating, The Stout Institute, Menomonie, Wis.
Louis F. Barocci,
Instructor, Industrial Arts, Cudahy, Wis.

The electrocoated waterproof abrasive papers possess many advantages over pumice stone, rottenstone, and garnet waterproof abrasive paper for rubbing varnished and lacquered surfaces. The speed with which the abrasives cut and the greater uniformity and quality of the surface produced, are the chief advantages of the electrocoated abrasives.

The materials necessary for the waterproof system of rubbing varnished and lacquered surfaces, are the various grits of the waterproof abrasive paper, sanding liquids, water, rubbing oils, rubbing compounds, rubber block, polishes, and waxes.

There are two major types of artificial grit — silicon carbide and aluminum oxide. Silicon carbide, which is near diamond hardness, is a product of the electric furnace. Aluminum oxide, also produced in the electric furnace, is extremely hard and sharp. Both of these abrasives are ideal for sanding varnish, lacquer, and other painting materials.

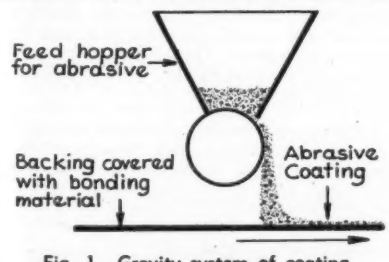


Fig. 1. Gravity system of coating abrasive paper

The abrasive papers are made by an electrocoating process which is patented. The method of coating abrasives by electricity gives an increased efficiency of abrasive performance over that obtained by using the conventionally made sandpaper coated by the gravity system. Figure 1 shows how abrasive papers are coated by the gravity system.

Electrocoated abrasives are applied to the backing under the control of an electric current. This causes the abrasive particles to stand on end and spaces them uniformly, with the sharp cutting edges fully exposed to give a faster cut, and spaced so as to prevent *loading* or *filling*. The electrocoating operation takes place between a positive and a negative electrode as shown in Figure 2.

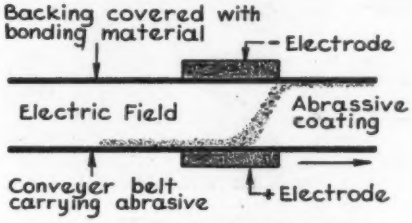


Fig. 2. Electric system of coating abrasive paper

When the abrasive particles, carried on a conveyer belt moving in the same direction as the paper backing, come near the positive electrode, the grains become charged and leap upward, thus impaling themselves on end in the bond of the backing. The result is a uniform spacing of the mineral particles with each particle standing on end.

COMPARATIVE GRADING CHART

Artificial abrasives*		Natural Abrasives		
Mesh	Number	Garnet	Flint	Emery
400	10/0			
320	9/0			
280	8/0	8/0		
240	7/0	7/0		
220	6/0	6/0	4/0	
180	5/0	5/0	3/0	3/0
150	4/0	4/0	2/0	2/0
120	3/0	3/0	1/0	1/0
100	2/0	2/0	1	1
80	1/0	1/0		1
60	1	1	1	1½
50	1½	1½	1½	2
40	1½	1½	2	2½
36	2	2		3
30	2½	2½	3	
24	3	3		
20	3½	3½		
16	4			

* These are made under various trade names, such as: Speed-grits and Durite by Behr-Manning, Troy, N. Y.; Carborundum, by the Carborundum Co., Niagara Falls, N. Y.; and Tri-M-ite, by the Minnesota Mining Co., St. Paul, Minn.

A flexible rubber sanding block is a valuable aid in sanding. By using such a block one can produce a true surface faster than can be done by other methods.

The following instructions explain the use of the waterproof system of abrasives for rubbing varnish and lacquered surfaces:

Sanding Undercoats or Surfaces

Use No. 280-C or 320-C waterproof paper for the first sanding. Where undercoats are very thin, do not use a grit coarser than 320 A. Use water as lubricant.

Where extremely fast cutting is desired for lacquer, it is recommended that lacquer cutting compound be used. This compound cuts at an extremely fast speed and produces an excellent finish. Use folded cloth pad and water when applying cutting compound. Fast and slow cutting compounds are available.

Sanding liquids have a distinct advantage over water in that the liquid does not *crawl* on a polished surface as water does. This is especially true on lacquer finishes.

Waterproof paper should always be thoroughly soaked in water before using to obtain full cutting efficiency. Waterproof paper is absolutely impervious to water, hot or cold. It is waterproof, front and back. It is not recommended that gas or oil be used as a lubricant for standing because they tend to raise the surface of the undercoat and enlarge scratches; also because of the fire hazards and the effect on the operator's skin.

Dry sanding should be reduced to a minimum because it creates a dust problem and tends to produce a speck-filled finish. For those few who do dry sanding, use No. 280-A Cutrite Tri-M-ite for the first sanding, and No. 320-A for the finish sanding or papers recommended by the Carborundum Company or the Behr-Manning Company.

Sanding Between Lacquer and Varnish

Varnish — Use with water No. 320-A or 360-A waterproof paper.

Lacquer — Use with sanding liquid, No. 320-A or 360-A waterproof paper.

Finish Sanding-Satin or Dull Finish

For lacquer or varnish, use No. 360-A or No. 400-A waterproof paper, with sanding liquid, rubbing oil, or water as lubricant. The grits used depend on the make of lacquer, number of coats applied, and type of finish desired. One can get the fineness of satin finish in varying degrees by using various grits from 360-A to 600-A. The varying degrees of satin finish are the result of the texture produced by uniform scratch marks of the grit. Use a rubbing block with the waterproof paper. Sand the surface with a full stroke with the grain. Wipe off the surface and examine the texture of the finish to determine the quality of work desired. The surface may be cleaned with a furniture polish. This produces a gloss effect. This gloss may be removed with a clean cloth dampened in water. Wipe the surface with the grain.

Finish Sanding-Gloss Finish

Use same steps as explained under dull satin finish using water as a lubricant and with the addition of the use of rubbing compounds. To apply rubbing compounds, prepare a clean cloth pad moistened in water, dip in rubbing compound and rub with grain of the surface. Use rubbing compounds sparingly for the best gloss effect. Clean surface with a dampened cloth and polish with furniture polish.

Finishing Moldings

Use rubbing compound and rub by hand or brush. By cutting the bristles of a varnish brush quite short and taping the ferrule you have a tool that is ideal for finishing moldings, carvings, points where rails meet legs, etc. Dip the brush in water and then in rubbing compound and apply. Clean up with furniture polish and rub dry with a soft cloth for a high gloss. Rub with a cloth dampened in water to produce a dull finish.

References:

1. "Paper and Cloth Abrasives," Minnesota Mining and Mfg. Co., St. Paul, Minn.
2. "Samples of Products Used in Wet or Dry System of Refinishing," Folder No. APSC2, Minnesota Mining and Mfg. Co., St. Paul, Minn.
3. Supply Catalog, The Carborundum Co., Niagara Falls, N. Y.

4. "How to Refinish Furniture," Minnesota Mining and Mfg. Co., St. Paul, Minn.
5. "How to Refinish Woodwork," Minnesota Mining and Mfg. Co., St. Paul, Minn.
6. "Reflection," Minnesota Mining and Mfg. Co., St. Paul, Minn.
7. "Coated Abrasive Products for all Purposes," The Carborundum Co., Niagara Falls, N. Y.
8. "A Lecture Course on Coated Abrasives," Behr-Manning, Troy, N. Y.
9. "Sandpaper — Its How and Why," Behr-Manning, Troy, N. Y.

PERSONAL NEWS

VERNE C. FRYKLUND APPOINTED ASSOCIATE PROFESSOR AT U. OF M.

Verne C. Fryklund has just been appointed associate professor of industrial education at the University of Minnesota, Minneapolis, Minn. At the present time Mr. Fryklund is associate professor and adviser in vocational education at Wayne University, and supervisor of vocational education in the Detroit public schools, Detroit, Mich.

Mr. Fryklund received his Ph.D. from the University of Minnesota; his M.A. degree from the University of Missouri, Columbia; his A.B. degree from Colorado College of Education, Greeley; and a diploma from the Stout Institute, Menomonie, Wis. He is qualified as a Smith-Hughes teacher trainer and worked seven years at the University of Minnesota.

Verne C. Fryklund

He was a staff member of the Employment Stabilization Research Institute in Minneapolis as an industrial specialist and clinical psychologist. In addition to his work at Minnesota, he also taught in the State Teachers College at Kearney, Nebr., for eight years. Before that time he taught in Denver and Greeley, Colo., and at Houston, Tex.

Mr. Fryklund holds memberships in the following organizations and societies: American Association for the Advancement of Science, Minnesota Academy of Science, American Vocational Association (life member), National Education Association, American Educational Research Association, National Association of Teacher Trainers in Industrial Education (and president in 1940), Michigan Education Association, Michigan Industrial Education Society, Mississippi Valley Manual Arts Conference, Phi Delta Kappa, Epsilon Pi Tau (laureate member), Mu Sigma Pi, American Legion, and A.V.A. Industrial Arts Standards Committee.

Mr. Fryklund has just completed a study of industrial-arts teacher education in the United States for the National Association of Teacher Trainers.

RICHARD M. SAVAGE GOES TO GORHAM NORMAL

Richard M. Savage has joined the industrial-arts staff of the Gorham Normal School at Gorham, Me. He is a new instructor and head of the industrial-arts department for that institution. Mr. Savage teaches at Gorham the first three days of each week, and is starting a new four-year degree-granting, teacher-training program for industrial arts this year. He is also the state supervisor of industrial arts.

Richard W. Savage

He is a former graduate of Gorham, received his graduate training, B.S. and M.A. degrees in 1937 from Teachers College, Columbia University, New York City, and has also taken some courses for his Ph.D. degree at the University of London in England.

Mr. Savage taught at Lewiston, Me.; Lincoln School, Columbia University; Cranford and Jersey City, N. J.; and at the State Teachers College in Millersville, Pa.

At the recent New England Industrial Arts Teachers Convention in Rutland, Vt.; he was appointed director of the committee for professional advancement.

♦ ERNEST C. COMSTOCK, at present dean of Trinidad Junior College, Trinidad, Colo., has recently been appointed director of the Nashville Technical and Vocational High School, Nashville, Tenn.

Mr. Comstock received his bachelor's degree from the Stout Institute, Menomonie, Wis., and did work on his master's degree at Fort Collins, Colo., and at Colorado State College.

Mr. Comstock was director of vocational education for four years at Staunton, Wis.; state supervisor of trade and industrial education for six years in Alabama; co-ordinator of the diversified occupations program in Jacksonville, Fla., four years; and teacher of trade and industrial-arts teacher training programs in the University of Alabama, University of Florida, and the University of Tennessee.

♦ DAN BERRY, RAYMOND HILGENBRINK and LEWIS SWAHLSTEDT have been added to the staff of the day school instructors of the David Ranken School of Mechanical Trades, St. Louis, Mo. They teach sheet-metal work and welding, machine drafting, and machine-shop practice respectively. The training program for 250 regular army men necessitated the addition of several more new day school instructors, and these are: Ervin H. Awishus, Virgil H. Bradley, Clyde R. Dillon, Paul S. Hayden, Joseph T. Juengst, Frank A. Krewet, Robert L. McAlister, Clarence G. Metzler and Hubert Ong in the automobile department; and Paul E. Grivet, Charles D. Jost, and Andrew D. Rathbun, instructors in radio, machine-shop, and welding departments, respectively.

♦ ALLAN ROBINSON, principal of the Mergenthaler School of Printing, Baltimore, Md., is one of the co-chairman of the general committee to arrange for the 22nd Annual Convention of the International Association of Printing House Craftsmen to be held in Baltimore in 1941.

♦ THOMAS C. RYTHER, formerly superintendent of the Printing Laboratory and in charge of teaching policies, Department of Printing and Rural Journalism, South Dakota Agricultural College, Brookings, S. Dak., is now director of the Bureau of Printing and instructor in journalism at the University of Kansas, Lawrence. He is a graduate of the latter university and was formerly on its faculty.

♦ WINSOR A. STRAW, will succeed Thomas C. Ryther as superintendent of the Printing Laboratory at the South Dakota Agricultural College, Brookings, S. Dak.

♦ VICTOR H. ELLIASSEN, who for the past two years was instructor in printing at the Technological High School, Atlanta, Ga., has returned to his former position as printing instructor at the Ashville Farm School, Swannanoa, N. C., where he taught from 1934 to 1938.

♦ MERLE BROWN has been appointed to fill the place made vacant by the resignation of J. H. Bowen in the machine-shop department of the high school at Independence, Kans. Mr. Brown has an A.B. degree from Kansas City University and has done graduate work in industrial arts at the Kansas State Teachers College at Pittsburg. He has had a number of years of teaching and of practical experience.

♦ HARVEY W. JESSEN has been appointed supervisor of industrial arts for Santa Clara County in California. A graduate of Ohio State University, Mr. Jessen has taught in Hugh Morson High School Raleigh, N. C., and Matthew Fontaine Maury High School, Norfolk, Va. Since coming to California he has been on the staff of San Rafael High School, and Kern County Union High School and Junior College in Bakerfield.

♦ H. G. LEET, formerly an instructor in the industrial-arts department, Senior High School, El Dorado, Kans., has been appointed assistant supervisor of trade and industrial education with the Kansas State Board for Vocational Education.

♦ CHARLES SCHRADER will take over the teaching duties formerly held by H. G. Leet, in the industrial-arts department of the Senior High School, El Dorado, Kans.

♦ STANLEY ANDERSON of Worcester, Mass., was appointed manual training instructor by the School Committee at East Greenwich, R. I. He will succeed Vernon Stapleford who has accepted a position at Concord, N. H.

♦ FRANK L. RICHARDSON, former printing instructor at Evanston, Ill., is retired and is now located in San Gabriel, Calif.

ASSOCIATION NEWS

♦ The Third Annual Four-State Regional Conference on Industrial Arts was held at Kansas State Teachers College, Pittsburg, on Friday and Saturday, October 11 and 12, 1940, with an attendance of over 300. Programs were provided for five sessions each dealing with one general topic, and ample time was provided for discussion from the floor.

The principal guest speaker was Dr. Homer J. Smith, professor of industrial education at the University of Minnesota, and vice-president of the American Vocational Association, who was scheduled for an address at the Friday evening session and who participated in the round-table discussions at the other sessions. Dr. Smith also addressed the weekly assembly of Kansas State Teachers College on Thursday morning on the subject, "Generalities of the Work World."

On Thursday afternoon and evening Dr. Smith assisted C. M. Miller, state director vocational education, in conducting a conference of Kansas directors, co-ordinators, and teachers of Smith-Hughes classes. On Wednesday evening he was entertained at an informal dinner given by members of the staff of the industrial education department of the College and the industrial-arts teachers of the Pittsburg city schools.

(Continued on page 12A)

Can you put them together?

"Which file is used where—and why?" That's a question the craftsman must be prepared to answer in order to be fully qualified for many of the jobs the industrial world has to offer.

Of the more than 3000 kinds, sizes and cuts of files produced by Nicholson, five largely used Nicholson or Black Diamond special-purpose files are pictured above. One each is associated with the five action pictures. Students, can you tell which is the Foundry, the Die-maker's, the Long-angle Lathe, the Brass and the Stainless Steel file? (*A clue:* File and action pictures mate up in "jig-saw" fashion. A REWARD: *Cut them apart, paste together correctly, send paste-up to us and receive a nail file* FREE!)

NICHOLSON FILE CO., 47 Acorn St.
PROVIDENCE, R. I., U. S. A.
(*Also Canadian Plant, Port Hope, Ont.*)

TECHNICAL BULLETINS on the design, features and uses of various Nicholson special-purpose files are available to instructors and graduates.

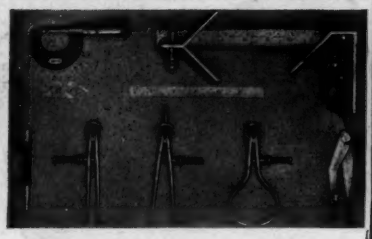
NICHOLSON FILES NICHOLSON U.S.A.

FOR EVERY PURPOSE

STUDENTS, TEACHERS, GRADUATES—Send for FREE BOOK, "A File for Every Purpose"

STARRETT

PRECISION TOOLS · EDUCATIONAL SETS · HACKSAWS



Starrett Catalog No. 26-CE shows many kits and separate tools designed especially for vocational training use. Write for a copy.

These 14 blueprinted pages show how to use the essential precision tools. Made to fit a standard student's notebook - 10 cents per set.

The complete line of Starrett Hacksaws includes all standard sizes for hand frames and hacksaw machines. Starrett Hacksaws cost little, last long. Make them your standard.

THE L. S. STARRETT CO., ATHOL, MASSACHUSETTS, U.S.A.

World's Greatest Toolmakers—Manufacturers of Hacksaws Unexcelled — Steel Tapes, Standard for Accuracy—Dial Indicators for Every Requirement

Standardize on

(Continued from page 40)

The Four-State Regional Conference, serving Missouri, Oklahoma, Arkansas, and Kansas, was organized three years ago at the request of industrial-arts leaders in the territory who because of the fact that Kansas State Teachers College at Pittsburg is strategically located almost at the geographical center, requested the college to provide a meeting place and forum at which industrial-arts teachers may talk over problems of common interest. The response has been remarkable, and the Four-State Conference has attracted widespread interest.

The topic at the Friday morning session was, "Problems of Organizing, Conducting, and Advertising the Industrial-Arts Program," chairman, A. W. Blake, Senior High School, Fort Smith, Ark. This session included discussion of the report of an investigation made by Kenneth L. Bing, graduate student at the University of Missouri, who secured the cooperation of 56 shop teachers in this territory in a study of the most important problems connected with carrying on an industrial-arts program in the high school.

The Friday afternoon session was concerned with "The Place of Industrial Arts in Public Education," chairman, Ray E. Williams, director industrial education, Parsons, Kans. The speakers presented the subject under four main heads: the junior high school the senior high school, the junior college, and guidance.

The topic of the third session on Friday evening was "Adjusting the Industrial-Arts Program to the Needs of the Community," chairman, Dr. William T. Bawden, Kansas State Teachers College. The speakers were: Dr. Homer J. Smith; H. P. Study, superintendent city schools, Springfield, Mo.; Finis M. Green, principal Senior High School, Pittsburg, Kans.

At the Saturday morning session a discussion of "The Social, Economic, and Philosophical Implications of Industrial Arts" was conducted by Dr. Hoyt H. London, University of Missouri.

The topic for the final session on Saturday afternoon was "Effective Methods of Organizing Instruction Materials for Industrial-Arts Shops," chairman, Roy V. Lulow, Central High School, Tulsa, Okla.

One feature of the conference was a booklet of 30 pages of mimeographed outlines of the material presented by the speakers, assembled and bound by the executive committee, and distributed to the members of the audiences.

Another prominent feature of the Four-State Conference is the commercial exhibits which have grown in scope and interest each year. — *William J. Bawden.*

♦ The Industrial-Arts Instructors of Worcester County, Md., have formed a club for the purpose of promoting industrial arts in this county. The major part of the work this year will consist of the revision of the present courses of study used in the county, emphasis being placed on the present and future needs of the industrial-arts work.

In addition there will be maintained an active problem and project exchange.

The members are: John T. Bruehl, Jr., Berlin; Gerhardt Neubauer, Pocomoke City; Robert J. Johnson, Ocean City; and Vernon Patz, Snow Hill. They are ably directed by their county superintendent, A. C. Humphreys — *John T. Bruehl, Jr.*

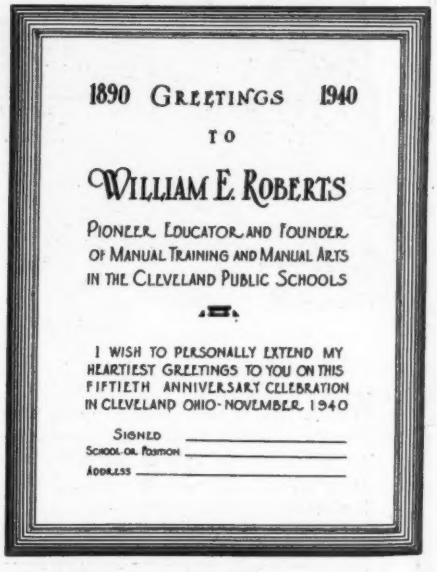
♦ The city of Cleveland, Ohio, celebrated the semicentennial of the introduction of industrial arts into the schools of the city, in October.

The first manual training school was opened in Cleveland in September, 1890. Its principal was William E. Roberts, who later was made supervisor of industrial arts, a position which he held until his retirement in 1933.

At the anniversary luncheon held on November 1, Mr. Roberts spoke on the "Beginnings of Manual Arts in the Cleveland Area," and Frank C. Moore, the present director of industrial arts in Cleveland, discussed the "Present-day Trends in Industrial Arts Education."

M. R. Klein, president of the Cleveland Industrial-Arts Club, presided, and E. N. Dietrich, state director of education, gave the welcoming address.

Filled with joy at the presence of their old leader, William E. Roberts, many of the industrial-arts teachers signed the testimonial certificate shown herewith, which were then gathered and presented to Mr. Roberts.


1890 GREETINGS 1940
TO
WILLIAM E. ROBERTS
PIONEER EDUCATOR AND FOUNDER OF MANUAL TRAINING AND MANUAL ARTS IN THE CLEVELAND PUBLIC SCHOOLS
I WISH TO PERSONALLY EXTEND MY HEARTIEST GREETINGS TO YOU ON THIS FIFTIETH ANNIVERSARY CELEBRATION IN CLEVELAND OHIO - NOVEMBER 1940
SIGNED
SCHOOL OR POSITION
ADDRESS

♦ The regular annual meeting of the Wisconsin Graphic Arts Association was held in the Milwaukee Vocational School, Milwaukee, Wis., on November 8, 1940. H. O. Griffith of Menasha presided.

(Continued on page 15A)

SCHOOL SHOPS *NEED* STRONG DRIVERS

Stanley Screw Drivers are favorites because fine quality and carefully engineered construction make them practically "Boy Proof." Specify Stanley and get these advantages:

★ Strong blades and tips of alloy steel . . .

★ Machine cross-ground tips hold in screw slots...

★ Handles shaped for comfortable grip . . .

Stanley Tool Catalog No. 34 describes the full line of Stanley Tools. Write for your copy.

STANLEY TOOLS

DIVISION OF THE STANLEY WORKS
EDUCATIONAL DEPARTMENT
NEW BRITAIN, CONN.

No. 1006 – "Stanloid" handle, toughest non-metallic substance known. Blades tempered entire length. Supplied in 4", 6", 8", 12" sizes. The best driver for automotive, machine and electrical shops.
STANLEY
No. "100 Plus" – Strongest wood-handled screw driver. Forged wings on tang prevent blade from turning in hickory handle which is capped with leather washer. Blade tempered entire length. Seven sizes from 3" to 12". A fine tool for general shop use.
No. 20 – Stanley "Hurwood" Screw Driver. Forged blade goes all the way through handle and is locked in place by two projecting wings and a rivet through ferrule, handle and blade. Nine sizes from 2½" to 18". A popular driver for woodworking shops.
STANLEY
No. 25 – Stanley Driver with Bolster Type construction. Four wings on bolster lock blade in handle. Blade is tempered its entire length. Handles are deeply fluted for a good grip. Eight sizes from 2½" to 12". A good tool for the woodworking or electrical shop.
STANLEY
STANLEY
TRADE MARK

(Continued from page 12A)

Among the high lights of the meeting was a talk on "Safety in the School Shop," by William J. Patlow of the Milwaukee Vocational School. Harold R. Johnson of Racine gave a talk on "Student Graphic Arts Clubs. This was followed by questions and discussions. "Establishing Uniform Courses of Study Throughout the State on the Various Levels" was the title of an address by M. R. Stewart of the Milwaukee Boys' Technical High School. Mr. Stewart emphasized the need for unified courses, even though the physical equipment varies from shop to shop. A lively discussion followed.

Officers for the year 1941 are as follows: President, O. A. Paciotti, Beaver Dam; vice-president, H. R. Johnson, Racine; secretary-treasurer, R. W. Sturm, West Allis; one-year director, Earl Thrall, Beloit; two-year director, Wm. R. Baker Menomonie; three-year director, Wm. J. Patlow, Milwaukee. — *Raymond W. Sturm.*

♦ The October meeting of the Massachusetts Industrial Education Society was held at Howard Johnson's on the Fellsway in Medford. Gustav Larson, retiring president, opened the meeting, after which the incoming president, Daniel Sullivan, took charge. Francis L. Bain, assistant director of the manual arts department, Boston, was the speaker of the evening. The subject was "The National Defense Training Program." The importance of industrial-arts teachers in the training program was ably presented by Mr. Bain.

The November meeting of the Massachusetts Industrial Education Society was held at Howard Johnson's in Medford. During the meeting the members discussed the possibility of affiliating with the American Industrial Arts Association, Mr. MacIntosh, a director of the N.E.A., gave us some of the advantages to be gained in joining this association.

Percy Marsaw, director of industrial arts in Worcester, was the speaker of the evening. The program in Worcester was very clearly portrayed. The program that Mr. Marsaw is planning to carry out demands the interest of all industrial-arts teachers.

The next meeting is the Annual Get-Together and will be held in Boston on January 11th. — *Otis W. Leary.*

♦ The November meeting of the Westchester Industrial Arts Club was held on Thursday, November 7, at the Longfellow Junior High School of Yonkers, N. Y., with Leo Tyrrell as host; Charles Lefferts, president, presiding.

Dr. L. F. Ashley, chief of vocational education for the city of Yonkers, outlined the organization and early history of the American Industrial Arts Association and concluded his talk by presenting present-day aims and objectives of the organization.

The shopmen voted to have a manufacturers' night at one of the Westchester schools during the month of March.

George Gordon, of Rye High School, proposed that all men, who have served the club continuously for ten years, be presented with a pin in recognition of their loyalty.

After refreshments, the group visited the "Defense School" of the Saunders Trade School which is in operation throughout the night hours. — *Herbert F. Lidstrom.*

♦ The second fall meeting of the Fairfield County Industrial Arts Teachers Association was held on Wednesday evening, November 13, in the Danbury Senior High School, Danbury, Conn.

Following a tour through the school shop, the program committee presented the following interesting speakers: Joseph Watkins, district engineer of the General Electric Corporation, who gave an illustrated demonstration lecture on "Fluorescent Lighting," "The History of Light," and "Black Light and Fluorescent Paint." Dr. John A. Whitesel of the Teachers College of Connecticut explained the purposes and plans of the American Industrial Arts Association. Following this address a business meeting was held at which time the association decided to affiliate with the American Industrial Arts Association. In accordance with a plan introduced in the association last year, the Shop Standards Committee distributed copies of original project plans submitted by the members.

The officers of the Fairfield County Industrial Arts Teachers Association are: President, G. Wesley Ketcham, Norwalk; first vice-president, Lawrence Houle, Bridgeport; second vice-president, William Torno, Westport; and secretary-treasurer, Benjamin Isenberg, South Norwalk.

NEW PUBLICATIONS

Estimating Costs of Houses — Labor and Materials per Square

By John F. Donnelly, Central Falls, R. I. Three-ring loose-leaf binder, 74 pages, 8½ by 11. Price, $4.

A system of estimating which is based on a complete breakdown of labor and materials per square. This system, devised by a man who has had 30 years of trade experience, is dependable and a great timesaver in all estimating work.

The prices for materials and labor in the problems contained in the book are varied. Naturally the one who wants to apply this particular system to his own estimating problems must substitute his own local costs of materials and labor, thus obtaining the exact cost per square.

A set of estimating forms have also been made part of the book.

Analysis of Activities in Household Mechanics

By Verne C. Fryklund, Ernest G. Gardner, Jack Bookholder, Charles H. Sechrest, and G. Harold Silvius. Paper, 154 pages, 8½ by 11. Department of Vocational Education, Detroit public schools, Detroit, Mich.

A thorough analysis of the thousand and one jobs that may be included under the title, "Household Mechanics."

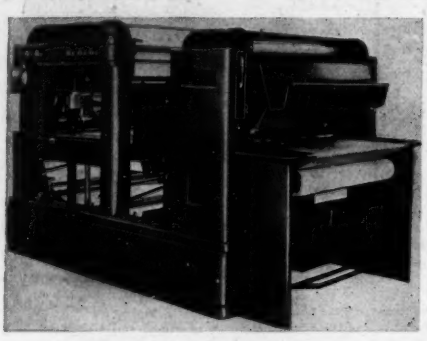
(Continued on page 19A)

SHOP EQUIPMENT NEWS
New Products—Publications

NEW BLUEPRINTING MACHINE

The latest addition to The C. F. Pease Co., family of streamline continuous blueprinting machines is the Model "22–16." This equipment is designed for use where requirements are such that the high speed of Model "22" is not needed, but where Model "22" printer's exclusive features are wanted nevertheless. The "22–16" combination consists of a Model "22" printer operating in conjunction with a Model "16" washing and drying machine.

With this printer slow blueprint paper can be used, which produces better and more permanent prints.



A few of the outstanding Pease Model "22" features are: sliding contact which smooths out all inequalities present in tracings; 24–¾ in. of uninterrupted exposure area; three-speed lamp control which allows the lamps to be operated on 10, 15, or 20 amperes as desired; and actinic arc lamps which furnish uniform light emission.

The Model "16" washer and dryer has horizontal water wash that floats the exposed paper horizontally, free from tension and wrinkles; quick-change chemical applicator which gives a change-over from blueprints to negatives in 30 seconds or vice versa and provides the only method of applying potash to one side and hypo to both sides of the paper; and five 8-in. aluminum drying drums heated either with gas or electricity which provide gradual drying without distorting the paper.

Model "22–16" produces uniform, contrasty prints with clean-cut, sharp lines at an exceptionally low cost per square foot. It is manufactured by The C. F. Pease Co., 2601 West Irving Park Road, Chicago, Ill.

NEW POWER TOOL FOR ART METALCRAFT WORK

A new portable power hand tool has just been developed for art metalwork and leathercraft by the Chicago Wheel and Manufacturing Co., Chicago, Ill. This tool can be of great help to both beginner and advance students in creating new interest in the general subject of art metalcraft.

This tool, known as the Handee Artizan, weighs a pound and a half and is shaped and balanced to fit the hand so that it can be guided easily over the work with one hand. It is driven by a high speed electric motor of the Universal type and has a reciprocating plunger action. The stroke of the plunger can be varied in a complete range from 3/16 in. to 1 1/16 in. by simple adjustment.

A wide variety of accessories have been developed to go along with the tool for hammering, planishing, sinking, forming, chasing engraving, and filing. On leather, with the aid of a tool attachment background and corners can be stamped and tooled with ease.

All of the hand tools ordinarily used in training of this kind are simulated with special accessories for the new motor-driven power tool. For instance, mallet head used for shaping, sinking, and forming is made from hardwood so the surface of the metal being worked will not be marred.

A tool attachment which screws onto the tool housing and serves as an extension handle closely guides the tool. In this way, leather may be stamped and tooled, and metals chased and engraved with perfect precision.

Instructors who have tested this new tool, report that none of the handmade attractiveness of the finished project is diminished in any way. Nor does this tool detract from the skill developed by hand-tool training as it merely eliminates the up and down arm motion necessary for hammering, filing, chasing, and the like. This new tool is suitable for all the soft metals that are used in art metalwork.

ATLAS ANNOUNCES NEW MILLING MACHINE

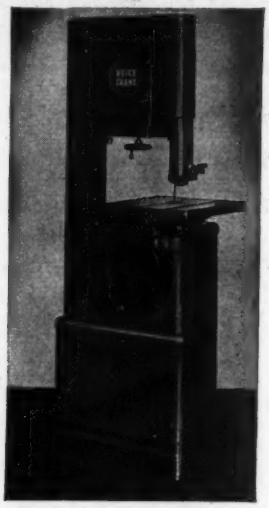
Designed for improved efficiency, versatility, and economy on small-piece milling, the new Atlas bench milling machine reflects careful study, sound engineering, and thorough knowledge of current toolroom and production requirements.

The new Atlas miller handles the full range of milling operations from heavy slabbing and facing to light end milling, cutting keyways, and finishing and layout work. Three types of table controls are available: standard screw feed, rapid-production lever feed, and the new "Changeomatic" for instant selection of automatic table feeds. A wide range of spindle speeds provides correct surface speeds for all types of work and cutters. Swivel vise, rotary index table, indexing centers, and coolant system are available.

Condensed Specifications: Table working surface 4½ by 18 in.; longitudinal table travel 12 in. (10 in. with "Changeomatic"); vertical table travel 6 in.; arbor diameter ⅞ in.; over-all dimensions 25½ by 32½ by 22 in.; motor recommended 1/3 h.p., 1740 r.p.m.; Timken tapered roller bearings for spindle. The Atlas Press Co., is at Kalamazoo, Mich.

NEW NO. 2300 HI-SPEED 14-INCH BAND SAW

The Boice-Crane Co., 1730 Norwood Ave., Toledo, Ohio, are announcing their new 14-in. band saw which has a wheel diameter of 14 in.; maximum depth of cut, 8⅝ in.; depth of throat, 13½ in.; tilting worktable, 15 in. by 15½ in.; height, 67 in.; and weight, 322 pounds.



The claims made by the manufacturers of this new tool are that it cuts 2 to 4 times faster than similar machines of the same and larger sizes, that it cuts at least twice as smooth on wood and fiber materials, and that the new welded steel frame provides great rigidity.

Single speed 1200 r.p.m. models with direct connected motors in both bench and floor types are being made, also V-belt driven bench models. A fourth model, made especially for the metalworking trade and other industrial materials fabricators comes equipped with selective speed gear box drive producing 8 speeds, between 1120 r.p.m. maximum, and 25 r.p.m. minimum, for cutting wood, fiber, metal, plastics resins, celluloid, cloth, paper, meat and bone, and so on.

NEW BERNARD PLIER

A new slip-joint plier is now being marketed by the Wm. Schollhorn Co., New Haven, Conn.

This new Bernard plier has the well-known parallel jaw action for which this manufacturer is famous. It is forged from nickel alloy steel, and has long, narrow jaws with concave grip. The jaws are deeply serrated to insure positive grip. The plier is hardened and tempered and the flush rivet is also hardened and accurately fitted. Sharpened cutters are an important feature.

The handles are broad and smooth and rest easily in the hand giving ample grip. The entire tool has blued steel finish. This new Bernard slip-joint plier is called No. P400.

PRECISION COUNTER TYPE TUBE MERCHANDISER

This new Series 914 is an attractive, streamlined mutual conductance type tube tester and set analyzer. It features a large 7-inch, swivel mounted, easy reading meter that can be fully rotated in a complete circle, as well as back and forth. It provides a full view of test results from all positions. The Series 914 is fully described in the Precision catalog for 1941 which may be obtained direct from Precision Apparatus Co., 647 Kent Ave., Brooklyn, N. Y.

(Continued on page 19A)

(Continued from page 16A)

THE OCTOBER STANLEY NEWS

The October number of the *Stanley News*, issued by Stanley Tools, New Britain, Conn., describes their new styles and sizes of Stanloid soft-face hammers, superblack nail hammers, extension rule with 7-in. extension slide, cold chisels and punches, hammers for metalworking shops, armor-clad-tipped electric soldering coppers, as well as their line of the famous Stanley "Boy Proof" tools.

The 1939 and 40 plan packets, Stanley plans, Stanley notebook pages and wall charts, drill-press vise, bench and pedestal grinders, hand routers, and router accessories, electric drill and drill stand, and the Stanley unishear, also are described.

"COATED ABRASIVES FOR FINISHING METAL"

The Educational Service Department of the Behr-Manning Corp., Troy, N. Y., have just released another unit on abrasives. It consists of an attractive chart upon which are mounted cloth and paper samples of coated abrasive used for finishing metal.

The samples permit the students to get first-hand knowledge of the different grits in which these abrasives are made for machine and hand surfacing of materials.

Shown on the chart are No. 24 Openkote and Closekote Metalite fiber disks for machine sanding, also samples of 50, 80, 150, and 240 grit Metalite cloth for hand sanding. Then there is a piece of No. 100 grit Metalite cloth, which is obtainable in 50-yard rolls ½, ¾, 1, 1½, and 2 in. in widths, and sample pieces of Adalox, Durite, and Speed-wet waterproof papers of a variety of grits, all demonstrating Behr-Manning's "Lightning" electrocoated products.

NEW SOUTH BEND 16-INCH LATHE CATALOG

Catalog No. 16-T, illustrating and describing the new 16-in. Series *S* South Bend Precision Lathe, has just been published by the South Bend Lathe Works, South Bend, Ind.

The catalog features the new 16-in. Series *S* Lathes, which are made in three types: Toolroom, quick change gear, and standard change gear. Each type of lathe is available with underneath motor drive, pedestal motor drive, and countershaft drive. The toolroom lathes are made in 6-, 7- and 8-ft. lengths. All other models are made in five-bed lengths — 6, 7, 8, 10 and 12 ft. Attachments for toolroom production and maintenance work are described, and features of construction are outlined in detail.

SKILSAW PORTABLE ELECTRIC TOOLS CATALOG

A new catalog describing the complete line of Skilsaw Portable Electric Tools has just been announced by Skilsaw, Inc., 5033-43 Elston Ave., Chicago, Ill. Drills, belt sanders, grinders, disk sanders, blowers bench grinders, and floor sanders are all illustrated and described. Practicability of all tools and their finer construction points are thoroughly shown in working pictures and in detailed specifications given for each tool.

Copies of this catalog will be sent to any interested reader upon request to the above address.

WESTERN PINES

♦ "The Story of Western Pines," a booklet recently published by the Western Pine Association, Portland, Ore., has been prepared to give the younger generation an insight into modern pine lumbering operations. This comprehensive little book describes briefly the harvesting of mature western pine forests and their speedy conversion into many useful forest products by a great industry employing thousands of skilled workers in their woods, camps, mills, and remanufacturing plants. Every teacher of science, industrial geography, and industrial arts who wants to keep abreast with current practices in one of the largest lumber-producing regions in the country, will certainly be interested in this new publication.

While of interest to all ages, "The Story of Western Pines" has been written primarily for students in the 7th, 8th, and 9th grades. The story is told in simple terms, is set in large, readable type and is devoid of any advertising or reference to manufacturers' names or brands, and has been profusely illustrated. The book is of convenient size, 5¼ by 7⅜, with a bright-colored cover.

Opening with an historical background of the first white-pine forests, the story shifts to the west and tells of the extensive forests of western pines, how forests grow, how conservation is practiced in the region, the importance of forest protection from fires, insects, and diseases, how the forests of Idaho white pine, ponderosa pine, sugar pine, and associated species are logged and manufactured into lumber, ultimately finding their way into scores of uses in homes, farms, and industrial plants.

Single copies will be furnished free and schools desiring quantity lots for distribution to students can secure them at nominal cost. Requests should be addressed to the Western Pine Association, 510 Yeon Building, Portland, Ore.

NEW PUBLICATIONS

(Continued from page 15A)

The study is divided into nine chapters and each of the separate divisions is treated under the headings of: General information, chart of operations and technical information, operations in plumbing, technical information, and guidance information.

The main divisions covered by the study are: Plumbing, doors and windows, electrical work, woodworking, woodfinishing, metalworking care of tools, and cement and plaster.

Household Mechanics

A Course of Study in Industrial Arts for Intermediate Grades, by Committees supervised by Verne C. Fryklund and F. R. Kepler. Paper, 167 pages, 8½ by 11. Department of Vocational Education, Detroit public schools, Detroit, Mich.

A revision of a course in household mechanics which has been in use for two years, to make it adaptable to grades seven and eight in either the elementary or intermediate type of school.

Blank analysis charts are provided so that the teacher may analyze suggested jobs, or jobs involving approximately the same operation, which the teacher wishes to substitute.

The material is divided into three parts, the first of which treats of aims, methods, texts, and reference materials, and tests and testing. The second gives the aims of general education as compared to those embodied in the revised course. The third gives the content of the course in detail.

Integrated Handwork for Elementary School

By Dr. Louis V. Newkirk. Cloth, 342 pages, 7½ by 10¼, illustrated. Price, $3.20. Published by Silver Burdett Co., New York, N. Y.

A helpful book which assists teachers in opening to pupils the door which leads to adventures in living.

Written by a man who has wide experience as a teacher, teacher trainer, and as a director of handwork and industrial-arts education in the Chicago Public School System, this book presents an authoritative direction pointer to those interested in integrated handwork with the other subjects in the elementary school curriculum, and to those who are in need of a guide to handwork techniques.

In part I of the book are treated the following subjects: handwork in the elementary school, place of handwork in teaching procedures, classroom and handwork-room equipment, materials, and hand tools. In part II the techniques of the following handwork activities are discussed: marionettes; lantern slides; book and paper-making; child-size projects; hand-loom and reed weaving; toys, models, and musical instruments; maps and charts; dioramas and panoramas; linoleum-block printing and blue-printing; soap carving and soapmaking; metal-working and electroplating; simple pottery; leathercraft; sewing and textiles; cooking and foods; and science equipment and apparatus.

(Continued on page 21A)

Super-Sensitive
"MULTI-PURPOSE"
TEST EQUIPMENT
Series 854
Super-Sensitive Tester
Especially designed to meet the exacting requirements of Laboratory, Industrial, Television and Radio.
20,000 OHMS PER VOLT D.C.
1,000 OHMS PER VOLT A.C.
• SEVEN D.C. and SEVEN A.C. voltage ranges to 6,000 VOLTS • SEVEN D.C. current ranges 0-60 MICROAMPS to 0-12 AMPS • THREE resistance ranges to 60 MEGS (self-contained batteries) • SIX D.B. ranges from —12 to +70 DB • SEVEN output ranges to 6,000 VOLTS • 4½" wide-faced, 50 microampere meter • 1% wire-wound bobbins and matched metallized multipliers. 2% D.C. and 3% A.C. overall accuracy.
SERIES 854P (Illustrated) complete with batteries and high voltage test leads. Net Price $39.95
Series 854J Super-Sensitive Industrial Circuit Tester
An unsurpassed portable instrument to satisfy industrial requirements for complete AC and DC circuit analysis. Combines Series 854 (described above) and Series J A.C. AMMETER providing 8 additional ranges of 0-300-600-1200 MA and 0-3-6-12-30-60 AMPS.
Series 854J (Illustrated) complete with batteries and high voltage test leads. Net Price $59.95
Series 954 Super-Sensitive AC-DC Set Tester and Dynamic Mutual Conductance Type Tube Tester
Provides all facilities of Series 854 combined with a complete free-point tube tester.
Series 954P (Illustrated) complete with battery and high voltage test leads. Net Price $65.95

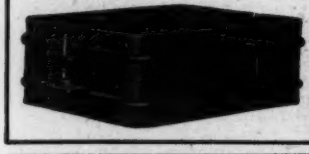
Write for the new "PRECISION" 1941 Catalog describing more than 40 test equipment models.

Address Att:-EDUCATIONAL DIVISION

PRECISION TEST EQUIPMENT
INDUSTRIAL • LABORATORY • RADIO • TELEVISION

PRECISION APPARATUS COMPANY
647 Kent Avenue Brooklyn, New York
Export Div.: 458 Broadway, New York, U.S.A.
Cables: Morhanex

THE MARKET PLACE



STERLING STEEL FLASKS

Made of Specially Rolled Copper Bearing Rust-Resisting Steel Channel sections having a solid center Rib and Solid Sand Flanges at Top and Bottom.

Write for Catalog of Flasks and Other Foundry Equipment

STERLING WHEELBARROW CO., Milwaukee, Wis.

LEATHERCRAFT

Everything in **LEATHER**

A *complete* line of leathers, tools, accessories, patterns, instructions, etc. Guaranteed quality—lowest prices. New white moccasin Kits—ideal for boys and girls.

Write today for free 84-page Catalog No. 1A!

OSBORN BROS. 223 Jackson Blvd., Chicago, U.S.A.

KNOCKDOWN CEDAR CHEST

Foreign and Domestic Lumber and Veneers.
Send 10c today for Illustrated Catalog.
GILES & KENDALL CO., Decatur, Ala.

TOOLS ALWAYS SHARP with PLURALITY OILSTONE TOOL GRINDERS

No. 450 Plurality Jr.

Now available in 3 sizes
No. 425 Plurality Sub Jr.
No. 450 Plurality Jr.
No. 475 Plurality

Grinding can be done on a cone, coarse or fine oilstone, leather stropping or emery wheels. Unit is compact, efficient, serviceable, easily accessible and has ball bearing direct motor drive. Especially guarded for school shop use. Details on request.

Mummert-Dixon Co. Hanover, Pa.
Originators and Pioneer Manufacturers of Oilstone Tool Grinders

ELECTRIC
MOTOR PARTS
FOR ALL MAKES

ALSO ALL MATERIALS AND TOOLS USED IN THE MOTOR REPAIR SHOP

Free Catalogue to Instructors

READING ELECTRIC CO., Inc.
200 William St. New York
227 W. Van Buren St. Chicago, Ill.

Specify

PAXTON

For highest quality in grade, texture and kiln drying.

Remember—the project can be no better than the materials from which it is made.

FRANK PAXTON LUMBER CO.
Des Moines Denver
Fort Worth Kansas City

"Westko Modeling Clay"

This clay is used in Schools and Art Institutions throughout the United States.

Write for prices and information

Western Stoneware Co.
Monmouth, Illinois

High Grade
Printing Inks

For SCHOOL PRINT SHOPS

COVERWELL INKS FOR QUALITY PRINTING

MARTIN DRISCOLL & CO.
610 Federal St. Chicago, Ill.
Portland, Oregon
407 E. Michigan St. Milwaukee, Wis.

ARCHERY MATERIALS
FOR THE SHOP

The L. C. Whiffen Company has specialized in archery materials for years. We have a thorough understanding of its problems. Our supplies are used in shop work all over the country. Our high standard of quality is nationally recognized. School shops are quoted special low prices. Write for illustrated catalogue.

L. C. WHIFFEN CO., Inc.
828 W. Clybourn St. Milwaukee, Wis.

The A-B-C's of Glue Heating

A—A separate insert of long-life, wear-resistant copper.

B—Heating elements wound on side and bottom to give uniform heating top to bottom—no chance for cold spots.

C—An inner lining of asbestos insulation seals heat within, adds safety.

D—An automatic precise thermostat that limits glue heating to proper 145° for maximum "stickitivity." Glue can't burn.

Sta-Warm Electric Glue Pots are modern, safe, fool-proof. Used in all modern factories and schools. Write for details.

STA-WARM ELECTRIC CO., Ravenna, Ohio
Represented by Oliver Mach. Co.

Pottery and Ceramic Supplies

Modeling and Pottery Clays . . . Glazes, Modeling Tools, Kilns and Potters' Wheels, etc.

Catalog on request

CERAMIC ATELIER
923 N. La Salle St. Chicago, Ill.

. SILK SCREEN PROCESS .

Today's modern method for economically reproducing all manner of posters, signs, lettering, and displays in colors. For full particulars, write . . .

SILK SCREEN SUPPLIES, Inc.
33 Lafayette Ave. Brooklyn, N. Y.

Industrial Furnaces
FORGES - MELTERS - OVENS

AMERICAN GAS FURNACE CO. PIONEERING IN THE BLAZING TRAIL

Complete Tables
BLOW PIPES
Suitable sizes for school shops
Write for complete information
American Gas Furnace Co.
ELIZABETH, N. J.

ELECTRO - TYPERS

Especially qualified to be of service to the school printshop.

Promptness and quality assured.

Forms returned same day received.

Badger Electrotype Co.
600 Montgomery Bldg.
407 East Michigan St., Milwaukee, Wis.

POTTERY
KILNS—CLAYS—GLAZES
WRITE DEPARTMENT B FOR COMPLETE CATALOG
AMERICAN ART CLAY CO. INDIANAPOLIS

POTTERY EQUIPMENT

PERENY POTTERY EQUIPMENT COLUMBUS O.

- ELECTRIC KILNS
- POWER WHEELS
- BALL MILLS
- WHIRLERS
- CLAYS
- GLAZES

SPECIAL EQUIPMENT

- ELECTRIC HEAT TREATING FURNACES
- ELECTRIC CRUCIBLE FURNACES

For complete details write to

Pereny Pottery & Equipment Co.
842 NO. PEARL ST. COLUMBUS, OHIO

PEWTER
FOR SPINNING

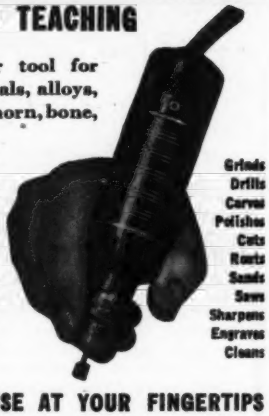
Circles—2" to 20" dia.—14-15-16-18 ga.
Sheets—18"x24"—12-14-15-16-18 ga.
Square Wires—$\frac{3}{16}$"-$\frac{1}{8}$"-$\frac{1}{4}$"-$\frac{5}{16}$" approx. sizes
Tubing—$\frac{3}{16}$"-$\frac{1}{4}$"-$\frac{3}{8}$"-$\frac{1}{2}$"—all inside dia.
Rods—$\frac{1}{16}$"-$\frac{1}{8}$"-$\frac{1}{4}$"-$\frac{3}{8}$"—approx. dia.
Hinges—1" and $\frac{5}{8}$"
Slugs—1$\frac{1}{4}$"-1"-$\frac{7}{8}$"-$\frac{3}{4}$"—dia. (in any thickness)
Pewter Solder—70/30—12 ga. round
65/35—Half Round
60/40—flat jewelers strip

Casting Metal for School Foundries
Send 6c in stamps for new teaching aids and information.

WHITE METAL
ROLLING & STAMPING CORP.
70 Moultrie St. Brooklyn, N. Y.
Telephones, EVergreen 9-4134-5-6

HANDEE TOOL OF 1001 USES
FOR EASIER TEACHING

Use this super tool for work on all metals, alloys, plastics, wood, horn, bone, linoleum, glass, etc. Students like the Handee because of its smooth, rapid response, enabling them to turn out better projects. Easy and safe for beginners.



A POWER HOUSE AT YOUR FINGERTIPS

Portable — you can set up shop wherever there is an AC or DC socket, 110 volts. The Handee is really a whole tool shop in one—uses 300 different accessories, quickly interchangeable in easy-working chuck.

Handee weighs only 12 oz
Speed 25,000 r.p.m.
$13.50 with 6 Accessories.

Order on 10 Days Trial or send for 64-page catalog of all Handee Products.

CHICAGO WHEEL & MFG. CO.
1101 W. Monroe St., Dept. IA, Chicago, Ill.

I.A.-1

☐ Send Free Catalog ☐ De Luxe Handee on trial

Name .....

Address .....

(Continued from page 19A)

Electric Wiring

By W. S. Ibbetson. Cloth, 264 pages, 5 by 7½. Price, $2.50. Published by Chemical Publishing Co., New York, N. Y.

Designed for wiremen, engineers, and students, this treatise treats of the fundamental principles underlying the theory and practice met with in electrical installation work in England.

The book contains 16 chapters in which the subject matter is quite adequately covered under the following headings: general principles; resistance; Ohm's law applied to d.c. circuits; Ohm's law applied to a.c. circuits; distribution of power; instruments; accessories; wiring systems; two-way and intermediate switching; insulators and cables; joints, soldering, etc.; testing installations, faultfinding; illumination, design, lamps; batteries and bells; dynamos and small generating plants; motors — a.c. and d.c.

NEWS NOTES

♦ LEONARD W. WAHLSTROM, for many years the head of the industrial-arts department of the Francis W. Parker School, Chicago, recently donated his library of books on industrial arts and vocational education, representing a collection made over many years, to the library of the Bradley Polytechnic Institute, Peoria, Ill.

Mr. Wahlstrom's material consists mainly of books and pamphlets on courses of study and projects appropriate to the industrial-arts field. He has won for himself an enviable place, partly due to his development of the idea of the Christmas Toy Shop whereby not only his pupils but their parents as well came to the Francis Parker School during the weeks preceding Christmas to make and repair toys for underpriviliged children.

♦ The Safety Education Projects, Research Division of the National Education Association, Washington, D. C., recently issued a new booklet entitled, "Dramatizations in Safety Education: An Annotated Bibliography." This publication includes reviews of more than 400 plays, playlets, pantomimes, and radio scripts. Information about each play includes the author, source, and cost of the play; number of characters in the play; school level for which it is suited, and a non-critical annotation. Distributors of plays and radio scripts are also included.

This booklet is sold for 25 cents a copy with reductions for orders of two or more.

♦ Request for back files of any and all periodicals on the graphic arts was made recently by Byron G. Culver, head of the Department of Publishing and Printing, Rochester Athenaeum and Mechanics Institute, Rochester, N. Y.

The school is keeping a subject index to periodical literature on printing, Culver explained, and needs the older files to permit historical research and surveys.

Any printers who have magazines to send are asked to write to Culver at the Rochester Athenaeum and Mechanics Institute.

♦ Three new leaflets have been prepared by the American Youth Commission. *"Finding the Facts About Youth"* concerns surveys used to gather information about the youth problem in three community areas so that constructive action could be undertaken. *"New Strength for America"* presents the unique recreational project in Columbus, Ind. *"Rallying Resources for Youth"* describes the community council development in Los Angeles County, Calif.; Dowagiac, Mich.; and Greenville County, S. C.

Copies of these leaflets may be obtained without charge by writing the American Youth Commission, 744 Jackson Place, Washington, D. C.

♦ The Board of Education of Rush City, Minn., voted that an industrial-arts department be installed for the school year 1940–41. Also, that an architect be engaged to plan for the alterations necessitated by the addition of the new department.

HOW DOES YOUR PRINT MAKING EQUIPMENT COMPARE WITH THE NEW OZALID MODEL "F"?

CHECK FEATURE BY FEATURE
Ozalid
OZALID MODEL "F"
COMPARATIVE VALUE CHART
1. Electrical consumption
2. Floor space required
3. Time required to make print from average pencil drawing 18" x 24"

OZALID MODEL "F" YOUR EQUIPMENT

4. Is it a single, self-contained unit? YES
5. Can you save by use of cut sheets? YES
6. Lowest priced for its production class? YES
7. Are prints dry-developed & true-to-scale? YES
8. Will it produce positive type, easy-to-read prints? YES
9. Does design enable one operator to handle capacity production? YES
10. Can you make dry-developed transparent duplicates for short cuts in drafting? YES

SEND FOR FREE MODEL "F" CIRCULAR

OZALID PRODUCTS DIVISION
GENERAL ANILINE & FILM CORPORATION
JOHNSON CITY, N. Y.
OZALID IN CANADA - HUGHES OWENS CO. LTD. MONTREAL

HOW to Improve Mechanical Drawings

This fall five more of the nation's leading universities are demanding that engineering students use ESCO Drawing Kits. Thousands used in High Schools and Vocational Schools. Why? — Because the ESCO Method is more accurate, more economical, more professional, easier to use and produces neater drawings than the old-fashioned board and T-square.

The ESCO Drawing Kit is COMPLETE—it consists of an extra fine, specially constructed drawing board with waterproof finish; built-in parallel ruling device; Bakelite straightedge; supplied in six sizes—12"x14", 15"x20", 21"x26", 24"x30", 34"x26", 30"x42".

Write for full particulars and catalog on ESCO Drafting Equipment.

ENGINEERING SALES COMPANY
Dept. S — 729 Clara Ave., Sheboygan, Wis.

BOIN LEATHERCRAFT STUDIOS
Specializing in
LEATHERS, TOOLS and FITTINGS
for Craft Groups in
SCHOOLS, CAMPS and INSTITUTIONS
Catalogue and Quotations on request
P. O. Box 91 Madison, New Jersey

Seeking a Position?

There is a greater demand for Industrial Arts and Vocational teachers than ever before at this time of the year. Opportunities for beginning teachers as well as those seeking advancement. Write, telling about yourself.

THE BALTIMORE TEACHERS AGENCY
William K. Yocum, Manager
516 N. Charles Street Baltimore, Md.

HOYT'S GENUINE PEWTER

is the highest grade. Shapes without cracking or peeling. Sheets up to 24"x36"; discs, 2" to 24" diameter. Write for further information and instruction sheets.

NATIONAL LEAD CO., Dept. P
New York Chicago St. Louis

FREE
TO SCHOOL BUYERS

150 page spiral bound catalog
40 page supplement

"Universal Has It!"

UNIVERSAL
HANDICRAFTS SERVICE, Inc.
1267 Sixth Ave. (Suite 300) New York, N. Y.

SHOP SUPPLIES
TOOLS AND MACHINERY
Headquarters for School Woodworking Equipment

Large and complete stock of woodworking machinery, tools and supplies. (Also good bargains in rebuilt machines.) *Knife grinding and saw filing a specialty*—quick service. Complete shop for expert machinery and tool repairs—satisfaction guaranteed. Write for catalog.

WOODWORKERS' TOOL WORKS
224 S. Jefferson St. Chicago, Ill.

BUILD YOUR BOATS WITH PLYWOOD

AETNA plywood makes boat-building easy and practical! Our **PLYWELD**, waterproof fir trade-marked **EXT-DFPA**, comes in big, easy-bending panels that make boats lighter and stronger. Your school shop will be proud of a well-built, permanently waterproof boat. Write to the Douglas Fir Association for free plans, and get special-sized panels for boat construction from us.

AETNA PLYWOOD & VENEER
1737 Elston Ave. CHICAGO, ILL.

RHODES COMBINATION
7-Inch Shaper and 3½-Inch Slotter

RMCo

1. A precision Tool. 2. Ideally suited for school use. 3. Small floor space and power requirements. 4. Exceptional instructional value. *Write for details*

THE RHODES MFG. CO.
Waltham, Mass.

1896 **ORIGINAL Toles Vises** 1940

18 Models for Woodwork only
2 Actions — 3 Sizes
Write for Prices

W. C. TOLES CO.
Woodstock, Ill.

LEATHERCRAFT

LEATHERS, LACING, TOOLS, ZIPPERS, SNAPS, ALL WOOL FELT, BEADS, WOOD PLAQUES, AND NEW FLEXIBLE WOODEN SOLE SANDLE KITS.

Schools send stamp for catalogue.

LAPCHESKE LEATHER COMPANY
1717 West 23rd Street Des Moines, Iowa

Materials for Brush Making

Brush Fibres, Tampico, Fibre Mixtures, Sterilized Horse Hair. Hair, Bristle and Tampico mixtures solid or taper stock, original lengths cut to size. *Samples matched.*

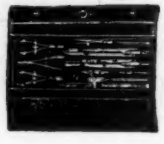
E. B. & A. C. WHITING CO.
Burlington, Vermont

ART METAL WORK
is one of the most popular crafts in school work.

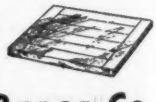
We specialize in equipments and supplies. When ordering hammers and anvils specify "Rose".

Send for a sample copy of our brochure "The Metal Crafts" and mention this magazine. It is full of helpful suggestions for teachers.

METAL CRAFTS SUPPLY CO.
10 Thomas St. Providence, R. I.



United States Blue Print Paper Co.
A complete line of Drafting Materials for Schools and Colleges
Let us quote your requirements



United States Blue Print Paper Co.
207 South Wabash Ave. Chicago, Illinois

New **MOTO-SAW** *An Electric* **SCROLL SAW**

JUST GUIDE IT!

More like magic than any tool you ever saw. Imagine an electric scroll saw only slightly heavier than a hand coping saw . . . a tool that takes no effort to run, no pressure to feed. Works at any angle—on big assembly jobs or on the tiniest piece you can hold in your fingers. Runs 7200 strokes a minute . . . so fast the blade seems to stand still. Sturdily built . . . only two moving parts . . . never needs oiling. Easily cuts intricate designs—so smooth it eliminates sanding. Novice or craftsman, a thrill awaits you when you get a Moto-Saw in your hand.

Safe as a Hand Saw
It's fast . . . cuts on an average of 1 ft. per minute up to ¾" medium hard wood. Operates on 110-120 V. 50 to 60 cycle alternating current. If your dealer does not yet have MOTO-SAW, send $4.85 . . . we'll pay postage. Or send $1, pay postman balance plus post. afr. MONEY BACK if not delighted after inspection.

DREMEL MFG. CO., Dept. S-251-A, Racine, Wis.

■■■ be sure to specify "how-to-do-it" A.T.S. textbooks and lesson texts when placing your book orders. Texts sent on approval. Complete catalogue sent free upon request.

American Technical Society
Drexel Ave. at 58th St. Chicago, Ill. (Dept. H.S.92)

RALPO PENCIL POINTERS

For sharpening leads only of wood and mechanical pencils. Lacquer finish 25 cents, nickle finish 35 cents, chrome finish 50 cents. Sent pre-paid if remittance accompanies order.

RALPO PRODUCTS Canton, Ill.

LOOMS, Table and Foot
Reed, Raphia, Handicraft Supplies
Send for catalog
J. L. HAMMETT CO.
CAMBRIDGE, MASS.

T.A. Foley Lumber Company
Buy direct from the manufacturer
PARIS, ILLINOIS

Built for 20-year Service

Shockproof mica insulation. Accurate Thermostat. Welded steel case. 1-piece copper glue container. The standard pot of woodworking industry. Eliminate fire hazard. Listed by Underwriters standards. Saves glue, electricity and time.

1 qt. . . . $14
2 qt. . . . $17
4 qt. . . . $24
8 qt. . . . $36
115 or 230 Volts

Hold-Heet Glue Pots

30-Day FREE TRIAL

Test one in your classroom for 30 days. If it is not entirely satisfactory, send it back.

RUSSELL ELECTRIC CO.
364 West Huron St.
CHICAGO, ILL.

Two texts which will help you to meet more adequately the specific needs of your shop "math" classes

APPLIED MATHEMATICS

By James F. Johnson

Here is a text which effectively meets the needs of a specialized, practical mathematics for the great majority of your boys who, instead of going to college, or into business leave school directly for the industries. APPLIED MATHEMATICS by Johnson has been specifically developed through firsthand experience in industry and teaching to prepare these boys more adequately for their particular lifework. Since it has come from the press it has been highly praised by leading schoolmen for its practical application of elementary mathematics to everyday problems in industrial activities, manufacturing, and trade work. Its wealth of instruction material and abundant practical problems meet the full requirements of elementary mathematics in all the building trades branches, the printing trades, the machinist and toolmaking trades, etc.

$1.40

SHOP MATHEMATICS

By C. A. Felker

Just off the press is this more specialized and advanced course in the practical application of mathematics for the student taking machine shop or toolmaking. It is an excellent course to be given after Johnson's APPLIED MATHEMATICS — for the boy who has decided on the trade he intends to follow and who wants to specialize in it in the training he receives at school. The author has not only had experience in teaching the subject in high school, he has also had two years in a machine shop, operating various machines. This combination of experiences has made possible a text that is thorough, practical, and sound in its approach to the subject it teaches. Throughout, shop mathematics is correlated with shop practice to assist the instructor in pointing out the application of the drill problems.

These two texts definitely fulfill shop "math" requirements as stated by one Director of Industrial Arts:

"I feel that a general course in applied 'math' should be given during the first year. APPLIED MATHEMATICS by Johnson is a good book which brings out my idea along these lines. The second year should take up what the boy intends to follow; for example, if he is a printer, then mathematics for printers is in order; if he intends to become a machinist, then machine shop mathematics is appropriate, etc."

Write for copies on approval

THE BRUCE PUBLISHING COMPANY

[illegible] Milwaukee, Wisconsin

Instructors Prefer
SUPER REGALS

. . Made by Le Blond!

Students at Cortland Central High School Cortland, N. Y. step ahead with Super Regals

● Super Regals have won the preference of instructors all over the country because they are produced in the same factory, with the same manufacturing skill that goes into LeBlond's heavy duty lathes, because they are identical in every important feature of design and construction. In short, instructors prefer Super Regals because *they offer the most practical training for the job ahead.*

In spite of all their "big lathe" features, Super Regals are easy to operate. Growing boys can practice on them for hours without tiring.

When planning new lathe installations, you will be acting in the best interest of your students if you investigate LeBlond Super Regals. The R. K. LeBlond Machine Tool Co., Cincinnati, Ohio.

★Largest Manufacturers of a Complete Line of Lathes!